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☞ An asterisk (*) denotes an illustrated article

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THE ARRIVAL OF M. DE LESSEPS.

Count Ferdinand de Lesseps arrived in New York, from the Isthmus of Panama, on Tuesday, the 21st ult. His first appearance in public was made before a special meeting of the American Society of Civil Engineers, on February 26th, at which he clearly and fully described his project for connecting the two oceans by an open cut canal, *without* locks, of sufficient capacity to pass the largest vessels. His mind, at least, is very positively made up as to the thorough practicability of the enterprise. The opinions of the eminent engineers who have during the past three months been making a special study of the work, on the ground itself, are given in favor of the route agreed upon by them, and appropriate estimates of quantities and cost have been furnished which would seem to render the execution of the work possible upon the raising of the necessary funds.

Financially considered, the scheme of M. de Lesseps is to place one-half the stock in Europe, the other half in America; and he feels the greatest confidence in his ability to secure the needed capital.

GENERAL ESTIMATE OF COST.

1st. Excavations (sidings included):

(*a*) Excavations above water:			
Earth	27,350,000 c.m.	$	13,760,000
Rocks, mean hardness.	825,000 "		1,155,000
Hard rocks	27,734,000 "		66,561,600
Excavations of rocks where pumping is necessary	6,409,000 "		23,072,400
(*b*) Dredging and excavations under water:			
Mud and alluvial soil.	12,000,000 "		6,100,000
Hard soil capable of being dredged	300,000 "		720,000
Excavations of rocks under water	377,000 "		2,639,000
			$114,000,000
2d. Dam of Gamboa: length 1600 m., maximum height 40 m			20,000,000
3d. Channels for the regulated flow of the Chagres, and for the Obispo and Trinidad rivers			15,000,000
4th Tide lock on the Pacific side			2,400,000
5th Breakwater in the Bay of Limon			2,000,000
			$153,400,000
6th Add for contingencies			15,200,000
			$168,600,000

NOTE.—The Commission has agreed to estimate the cost of the work at the prices fixed by the Paris Congress for the various items.

THE TENTH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The recurrence of the annual meetings of this Society coming, as they do, in the winter season, is always looked forward to with interest, and an expectation that something of value to many will be presented.

Whatever may have been the fulfilment of these expectations in the past, and certainly they have some times been realized, it may be truly said that, on the present occasion, they were more than realized.

Mr. J. R. Thomas, President Society of Gas Lighting, and Mr. Eugene Vanderpool, were present, the former as Honorary Member, and the latter as a guest. There were also present, from New York, Capt. W. H. White, Secretary of the American Gas Light Association, Mr. Goodwin, of Philadelphia, Mr. Balmore, Engineer of the Harlem Gas Light Company, New York, and others.

The close attention to business, the lack of useless and trivial talk, and the soundness of the principles advocated in the different papers and discussions, shows that the Association enters the second decade of its existence with a full determination to be ever in the advance, seeking constant improvement, ever ready for any new developments of truth that shall lead practically to cheaper gas resulting from more economical proceedure both in manufacture and distribution.

The paper read by Mr. Greenough, on the subject of "Gas Furnaces for Heating Benches," was one that we were exceedingly gratified to hear. As an evidence that the younger minds are not allowed to get rusty, but are on

the *qui vive* to do better than those who have gone before, it was a most opportune subject to inject into the discussions, particularly as it followed the most thorough discussion of the paper by Mr. Cabot, "On the Use of Tar as Fuel." The whole subject is so closely joined together that it seemed as one topic. We rejoiced exceedingly to see the younger Greenough step forth as the champion of a most needed radical change in the methods of heating benches; and he may be well assured that his leadership in this direction will be quickly followed by others who will not be slow to see the advantages to be gained.

There is also another point which is satisfactory in this connection, viz.; while Mr. Greenough has gone to the bottom of this matter and, after thorough examination, has evolved several systems of furnaces, in England little has been done; and, although some experiments are now being conducted at the South Metropolitan Company, no system has ever been taken hold of as we should suppose it would have been. Can it be that they are modestly standing back to allow us to take the lead in this matter? If so, it is very kind of them; but we do not believe it. If we can, however, lead off in this matter, should not every American feel a just pride? Most assuredly, we should.

It is impossible to give here even a synopsis of the proceedings, a verbatim report of which will be given in these columns until finished.

The social features connected with this meeting of the Association were of a most agreeable character. Headquarters were at "Young's," and the meetings were held in two large connecting rooms. On the evening of the first day a most delightful banquet was enjoyed. The newly-elected chairman of the Association proved himself fully equal to the arduous duties of presiding, and afterwards of leading in the hymns sung by his choir. The "Deacon," who was present, added much to the entertainment, and led off with a most capital after-dinner speech. His account of the future dangers in the "freezing line" will be long remembered.

The change of base to "Young's Hotel," seemed very satisfactory to all, and every effort made by the Committee to please everybody, seemed to have been crowned with unusual success.

[From the "London Journal of Gas Lighting."

Report of The Gas Light and Coke Company.

The report of the Directors and the accounts of The Gaslight and Coke Company for the past half year have been issued, in anticipation of the ordinary meeting to be held on Friday next. It goes without saying that the Company, now the largest in the world, is in a highly prosperous condition, and is likely to progress at a still more rapid rate in the future. Every day adds to the number of the customers, and this must continue to be the case, so far as we can see, for long years to come. Perhaps the best indication of the increase in the number of consumers is afforded by the considerable addition to the receipts for meter rents—viz., £633—during the past year. A further proof is evidenced in the amount of coals carbonized. Thus we find that in the last half year the quantity of coals carbonized was 598,477 tons, being an increase of 30,237 tons upon the amount of the corresponding half of 1878.

The make of gas has of course in like manner increased. The figures which show us the amount of gas made are formidable; but here we shall simply mention that the increase in the quantity of gas manufactured during the past half year, over the corresponding period of the previous year was no less than 266,514,000 cubic feet. It should be said that from every ton of coal carbonized, 10,160 feet of gas were obtained. Of the prodigious quantity of gas made, the greater part is accounted for, the loss amounting to only 5½ per cent. The revenue account further illustrates the progressive prosperity of the Company. The increase in the amount received for gas sold for private consumption was no less than £31,221. We may note here a curious fact, that while a large number of additional public lamps were erected, there was a decrease of £225 in the sum received for gas supplied to them. This may, perhaps, be accounted for by the parsimony of the parishes who burn by meter, and who have reduced the hours of consumption, much to the dissatisfaction of the inhabitants. This, and an unfortunate decrease in the amount received from the sale of coke (£15,202) form the only discouraging features in an otherwise highly-satisfactory balance sheet.

It is much to be regretted that the efforts which the directors have made to promote the sale of coke have not been more successful; but the fact is that the quantity produced is now so enormous, that it is scarcely to be wondered at that an outlet cannot be found for anything like the whole of it. We have more than once recommended the Company to try the manufacture of artificial fuel, as one means of getting rid of a portion of this important residual, and we may here repeat the suggestion. The practice of working up tar for products, which we pressed upon the attention of the Company for several years, has turned out, as we were certain it would do, highly successful. The receipts for tar and tar products have increased by £53,025. "Tar products" for the past half year figure in the accounts for £34,615, which seems to indicate that their manufacture must be very profitable.

We may presume that the Company have not the means of working up the whole of the tar produced at all their stations, otherwise the receipts under this head must have been much more considerable. Ammoniacal liquor and sulphate of ammonia yielded a considerable increase—viz, £3314; but this increase is easily accounted for by the additional amount of coal carbonized. The total receipts for the half year amounted to £1,301,049, which is an increase of £72,158 over the same period of the previous year. Naturally, under the circumstances we have stated, the additions made to the income have involved additional outlay. Thus, coals cost £19,186 more than they did in the corresponding half of 1878. The more coals carbonized and the more gas made, the greater is the cost for wages and for purification, under both of which heads an increase of expenditure is shown. The total expenditure for the half year was £896,618, being an increase of £38,648 over the corresponding half of 1878. Thus the balance to be carried to net revenue account amounts to £404,430, which, with the balance carried over from June last, gives a total sum of £516,357. The amount required to pay interest on debentures, preference shares, etc., is £147,164, which leaves a sum amounting to £369,193 applicable to dividend on the ordinary "A" stock. When the dividend recommended in the report, at the rate of ten and a-half per cent. per annum, has been paid, there will remain a sum of about £150,000 to be carried to reserve. It is very satisfactory to see that all the reserve-funds of the Company show a considerable increase.

We may here take a glance at the capital engaged in this huge concern. Briefly stated, the amount of share capital paid up on Dec. 31, 1879, was £7,372,745, which leaves £892,255 still to be issued under the authority of their Act of 1876. The Company have been very successful in raising capital under both the auction and tender systems. The public auction in June last had not, perhaps, all the success that could have been desired; but whatever was deficient was amply made up when an experiment was made with the "tender" system. In this case £100,000 of ordinary "A" stock was offered at a reserve price of £176 for every £100 issued, and brought applications for nearly twice the sum offered. The outside public, we understand, did not tender freely, and the greater part of the sum was allotted to existing proprietors, from whom the bulk of the applications came. This shows the confidence the proprietors have in the stability of the undertaking. The auction and tender systems have brought a new item into the capital account—viz., "premium capital"—which already amounts to £80,516; and this, as our readers know, bears no interest. The sum already amounts to £1,643,510, leaving £917,990 still to be raised by way of loan.

Gas Engines.

VINCENNES, IND., Feb. 17, 1879.

AMERICAN GAS LIGHT JOURNAL, New York—

Gentlemen: We have just ordered by cable, through Messrs. Schleicher, Schumm & Company, of Philadelphia, a 17 horse-power gas engine, of the Otto Style, for use in a grain elevator now being erected in this city. It will run the corn sheller, and the parties expect to place a seven horse power in the elevator, for handling the grain, early in the spring.

I believe the 17 horse power engine is the largest gas engine ever brought to this country. We now have a 1½ horse power engine, of the Otto and Langen's Patent, in the Daily *Sun* Printing Office. They use the engine, on an average, about two hours per day, at a cost of six cents per hour.

G. G. R.

Carbonic Oxide.

NEW YORK, February 2, 1880.

Mr. Editor: Mr. Allen attempts to show that "Carbonic Oxide Contained in Water Gas" is not poisonous, from the fact that a young man survived after remaining in a room for 12 hours where there was a small per cent. of his (Mr. Allen's) so-called water gas. According to the statement, and figures given, gas was discharged from a four feet burner, for 12 hours (or 48 cubic feet in all) into a room containing 1140 cubic feet of air, and the young man "had rolled off the bed upon the floor, to the edge of the door, where he succeeded in getting a little fresh air." Why he did not open the door is not stated.

Instead of showing that carbonic oxide is not poisonous, as Mr. Allen claims to do, the circumstances show either the young man inhaled but very little of the gas, or that there is but very little, if any, water gas remaining in that made under the "Allen-Harris Process," when it reaches the consumer, as has been claimed by those who have analyzed it! I think the latter theory the correct one.

COAL GAS.

[Communicated Article.]

On Water Gas from Coal.

Its Calorific Energy and Intensity as Compared with Coal.

By Prof. Henry Morton, Ph.D.

In reading the long and remarkable article in your last issue on "Water Gas from Coal and Petroleum," I notice your suggestion of a careful consideration and full discussion. Even without this invitation, I think I should have considered it my duty, as a conservitor (however unworthy) of scientific truth, to write a few words at least in reply to so ingenious an attack upon that paladium of modern science, the doctrine of the conservation of energy, and to expose the old fallicy of perpetual motion, even when advocated by a gentlemen so well known and so deservedly respected as Gen. Haupt.

We all know that even "Homer nods" occasionally, and this may explain the strange oversights by reason of which Gen. Haupt has assumed so remarkable a position of antagonism to universally accepted doctrine.

Thus, he tells us in effect that though the elements of water can in their reunion develop no more heat than is needed to separate them, yet that by combining carbon with water, as in the theoretical formation of water gas, *the theoretical calorific power of something will be doubled.*

Divested of all ambiguity of statement, this would simply mean that the calorific equivalent of carbon or hydrogen, being, as we know, 14,500 for the first and 62,000 for the second, could by some means be made 29,000 and 124,000 respectively; or, in other words, that we might get, for example, 29,000 heat units out of a pound of carbon. In his numerical example he only claims 18,000, but in principal this is just as bad, and is a clear denial of the "conservation of energy," and an avowal of the principle of "perpetual motion."

The reasoning by which the General has reached this conclusion is as remarkable as its result. Thus he says—

"Suppose that two elements, the union of which is accompanied by a certain degree of calorific energy, shall have been dissociated by an application of force, the energy of reunion of the same elements may not, and probably will not, exceed the force exerted in their separation.

"But suppose there is no reunion of the same elements, but that each of the separated elements forms a new union with two foreign elements, or with two new and different equivalents of a single element. Will there not be two operations, each developing an amount of energy equivalent to that which would attend the reunion of the two elements originally dissociated, and thus double the calorific development?"

Now, except for the rather halting admission of the truth of "conservation" at the end of the first paragraph, the facts here are correctly stated down to the last sentence.

This sentence, however, is entirely inaccurate in form, and in suggestion utterly wrong.

Thus, no general rule could be given for a relation between the energy required to dissociate a compound and that evolved by the union of its elements with *other* bodies. Take, for example, the compound chloride of zinc. To decompose one pound of this we should need 1529 French heat units. This would give us about half a pound each of zinc and chlorine. If now we combined the zinc with oxygen it would yield 650 units, and if we combined the chlorine with hydrogen it would yield 11,891 units, or, together, 12,541 units; but in this case we should have entirely new bodies as the result of the reaction, and in the case of the hydrogen have introduced an immense amount of energy into the system from a new source. If, again, in place of combining the liberated chlorine with hydrogen, we combined it with antimony, this would have yielded but 353 units, or we should in all have but 1003 units, or 526 units less than were expended in effecting the decomposition of the chloride of zinc. Clearly each case of this sort must be considered by itself, and the resulting energy of the new combinations will depend upon what is brought into the system by the new substances introduced.

The General then continues:

"This is precisely the condition of things which exists in the case of water gas. Carbon, at a proper temperature, decomposes steam, with formation of equal volumes of carbonic oxide and hydrogen, each of these volumes requiring precisely the same amount of oxygen and developing the same number of heat units in combustion.

"Now, it is conceded that if the dissociated hydrogen and oxygen are reunited, a degree of calorific energy will be developed not greater than was exerted in effecting their separation; but it must be remembered that there is another and equal volume of combustible gas, carbonic oxide, which requires another equal volume of oxygen supplied by air, which costs nothing, and in the union develops the same number of heat units as in the combustion of the hydrogen. Must not the theoretical calorific power, therefore, be doubled?"

Here we have fallacy and confusion throughout. In the first place, the case of water gas has no analogy whatever with such instances as were suggested before, and of which I have furnished examples above.

In the case of water gas the bodies used are carbon and water, of which the carbon is the sole source of energy, and at the end of the process the water is returned to its original state, and the only body changed is the carbon, which is converted into carbonic acid, exactly as if it had simply been burned. Whatever heat *it* will develop may have been obtained (losses excepted), but no more.

The General has evidently lost sight of this important fact in the multitude of his reasonings.

Suppose we start with a pound of carbon and a pound and a half of water in each instance, and in the first case burn the carbon in the air, allowing the water simply to look on. The pound of carbon will take gratis $2\frac{2}{3}$ pounds of oxygen from the air, and will produce $3\frac{2}{3}$ pounds of carbonic acid, which, with the $1\frac{1}{2}$ pounds of observant water, will be on hand at the end of the operation.

In the second case, suppose that we put the 1 lb. of carbon and $1\frac{1}{2}$ lbs. of water into a retort, and, *by aid of a good hot fire, supplied by other fuel outside*, convert them into theoretical water gas, half carbonic oxide and half hydrogen, and then burn these in the freely supplied air. We shall have $2\frac{1}{3}$ pounds carbonic oxide, which will take $1\frac{1}{3}$ pounds of oxygen from the complacent air and give us $3\frac{2}{3}$ pounds of carbonic acid, as before. The hydrogen, of which there will be $\frac{1}{3}$ of a pound, will take $1\frac{1}{3}$ pounds of oxygen from the air to form again $1\frac{1}{2}$ pounds of water, so that, as the result of this operation also, we have $3\frac{2}{3}$ pounds of carbonic acid and $1\frac{1}{2}$ pounds of water.

As regards the generous asmosphere, it has yielded $2\frac{2}{3}$ pounds of oxygen, only in place of giving it all to the carbon it now gives half to the carbonic oxide and half to the hydrogen, from which the carbon had already stolen its normal supply.

Such a cycle of changes as this brings nothing new into the system except the oxygen, which is the same in each case, and clearly can develop no new energy from the bodies concerned; but evidently it may—in fact, it does—acquire energy from the *extra carbon or other fuel burned outside the retort*, and for this, of course, it pays full price.

I will not follow the General in his numerical example, in which he has *forgotten to take into account the calorific value of the pound of carbon put into his retort.*

This pound of carbon represents no less than 14,500 heat units, which theoretically might be obtained from it by burning it in air, which costs nothing;* and as this carbon must be paid for as much as any other part of the fuel consumed in the production of the carbonic oxide and hydrogen, it is certainly unfair to omit it on the debit side and yet include it as carbonic oxide on the credit side of the account.

If this oversight of omitting the carbon is corrected in Gen. Haupt's account, his "total calorific energy expended" will be 17,556 units, which agrees as well as could be expected with his own estimate of the energy developed by the water gas on burning, which he finds to be "about 18,000 units." This also brings the result into accord with the accepted laws of conservation of energy.†

In the next column our author develops another numerical example, in which, to make up for his former partiality in neglecting the carbon *in the retort*, he entirely ignores that *in the furnace*, by which the retort is heated. Thus he says:

"A simple illustration of the calorific power of water gas, as compared with the hydrogen and carbon of its constituents, can be given thus: 1 lb. of hydrogen unites with 8 lbs. of oxygen, forming 9 lbs. of water, and develops in combustion 62,200 units.

"By contact with carbon at a proper temperature the 8 lbs. of oxygen unite with 6 lbs. of carbon, forming 14 lbs. of carbonic oxide, which develops 4443 units per pound, or a total of 62,200 units.

"The water formula is H_2O and carbon C. Dissociation produces H_2 and C.O. By taking oxygen from the atmosphere it becomes—

H_2+O, which develops 62,200 units,

and C.O.$+O$, which develops 62.200 units.

And the combustion of the two gases develops twice the 62,200 units of the original H_2O, or 124,400 units.

---

* I of course realize the practical impossibility of this, and the loss caused by heating up the nitrogen of the air; but this same action takes place with the hydrogen and carbonic oxide when they burn, and we may therefore, for simplicity, omit this consideration from *both* sides of the account, when, as at present, the question is discussed from a purely theoretical standpoint.

† The figure which the General here uses for the heating effect of hydrogen differs from that which he employs in his second example, being in this case corrected for certain practical losses, and in the second example taken at its full theoretical value. I have preferred to take the full theoretical equivalent throughout, as the question is one purely of theory; and the introduction of what is, after all, only a partial correction for *some* of the practical losses, merely complicates the problem, and is liable to mislead.

"The carbon used in the production of the water gas was 6 lbs., and the maximum calorific energy of combustion of carbon theoretically would be 14,500 units per pound, or 85,800 units for 6 lbs., which is greatly below the 124,400 units theoretically developed in the combustion of the gases."

If it were sufficient to put the six pounds of carbon and nine pounds of water into a cold retort, in order that the water gas should be evolved, then undoubtedly the above conclusions would be correct, and by this simple means 38,600 heat units would have been *created*.

But, as Gen. Haupt correctly suggests, this reaction takes place "at a proper temperature," and in the previous example he shows that for this "proper temperature" some 8964 heat units per pound of carbon acted upon, are needed.

Now, such an item as this is evidently quite too serious a one to be omitted from the calculation, and if introduced entirely upsets the conclusions above reached.*

Leaving, then, this paper of Gen. Haupt, which is vitiated throughout by these remarkable oversights as to fundamental facts and principles, I will state the case here involved in a straightforward manner, and in accordance with the universally accepted principles of "energy."

To obtain my fundamental datum of the amount of energy required to decompose a pound of water, I have not gone into a detailed summation involving many uncertain quantities, but have obtained it at once on the general principle universally admitted, and accepted in substance by Gen. Haupt at the opening of his paper, viz., that the energy necessary to decompose a compound is the same which its elements will develop on reunion. Thus, $\frac{1}{8}$ lb. of hydrogen combining with $1\frac{1}{2}$ lb. of oxygen to form $1\frac{1}{2}$ lbs. of water, will develop 10,297 heat units; therefore 10,297 heat units will be required to decompose $1\frac{1}{2}$ lbs. of water.

Suppose that, as a theoretically possible case, we place in a retort one pound of carbon and one and a half pounds of water. These, if sufficient heat is supplied, might be assumed to react so as to form carbonic oxide and hydrogen only, according to the following equation:

	$C + H_2O$	$= CO$	$+ H_2$
Atomic weights.....	$12 + 2+16$	$= 28$	$+ 2$
Weight in pounds	1 lb.	$+ 1\frac{1}{2}$ lb. $= 2\frac{1}{2}$ lbs.	$+ \frac{1}{8}$ lb.

The amount of heat required to decompose this $1\frac{1}{2}$ lbs. of water would be exactly that which the resulting hydrogen would develop in combining again with oxygen. This hydrogen is $\frac{1}{8}$ of a pound, which, multiplied by the thermal equivalent of hydrogen, 62,032, is 10,297 thermal units.

We thus see that 10,297 heat units would be needed, if applied from outside, to decompose the pound and a half of water, if no aid were received from the pound of carbon in the retort.

This carbon, however, will evidently itself oxydize to CO, thereby developing 4453 heat units, and thus only 10,297—4452=5844 heat units need be supplied to effect the change of the carbon and water into carbonic oxide and hydrogen. A few hundred units, it is true, should be added to heat up the carbon to the combining temperature.

We have, then, as the total material and energy expended in the action. First, 5844 heat units supplied to the contents of the retort from an exterior fire of some sort.

Second, one pound of carbon put into the retort and converted into carbonic oxide during the process. This pound of carbon, if burned alone, would of course develop 14,500 heat units.

Expressing all in the shape of heat units expended or used up in the formation of the new materials, carbonic oxide and hydrogen, we have—

From outside fire.....	5,844
Carbon used up in retort.....	14,500
Total.....	20,344

The new fuel produced will consist of $\frac{1}{8}$ lb. of hydrogen, developing by perfect combustion 10,297 heat units, and 1 lb. of carbon, in the form of carbonic oxide (weighing $2\frac{1}{3}$ lbs.), capable of developing by perfect combustion, according to Dulong, 10,411 heat units; the sum of these, 20,708 heat units, corresponds with the amount of energy used in preparing this double fuel, as nearly as need be, in view of the numerical uncertainties in the data used, and the fact that the heat required by the carbon to bring it to the point of union has been left out of the account.

In this entire discussion I have followed Gen. Haupt in treating the question from a purely theoretical standpoint, assuming that carbon and water would react so as to make equal volumes of hydrogen and carbonic oxide, and that the full thermal equivalent would be obtained in each and every reaction.

Of course, nothing of this sort is obtainable in practice.

While in theory but some 6000 units of externally supplied heat are needed for each pound of coal treated, which would represent less than half a pound of carbon, in practice the best results show that at least five pounds of coal or equivalent fuel must be burned outside the retort for every pound treated inside.

Again, the loss by burning in air in place of pure oxygen, of course practically reduces the available heat obtainable from *any* fuel.

Moreover, these losses all act against the energy expended upon the coal and water in the retort, and leave the demanded energy necessary to effect the reaction as great as ever.

In other words, the 6000 units of heat required to effect the reaction are an unchanged constant, while the coal burned under the boilers and retorts, and the produced hydrogen and carbonic oxide when burned afterward in air, will yield nothing like their theoretical equivalents.

Thus, if we burn coal directly in air, we sustain a loss, once for all, due to the nitaogen, etc.; but if we convert it into water gas first, we sustain the same loss, from the same cause, when the products are burned, and also the enormous loss in the application of the exterior fuel needed to effect the change of carbon and water into gas.

In mechanics, every change of motion involves loss by friction and the like, and exactly the same in general principle is true in chemical reactions.

By no combinations of levers, pulleys, screws, etc., can we make one horse power into two; but, on the contrary, all such contrivances will always occasion a loss of useful energy, however much they may facilitate the application of what is left. In an exactly similar manner chemical transformations can never increase the energy of bodies, but will involve some loss, however much they may facilitate the ease and efficiency in application of what is left.

In conclusion, I will venture to quote here from a paper published by me in the *Sanitary Engineer* of Oct. 1, 1879:

"The doctrine of 'conservation of energy' teaches us that a cycle of changes ending where it began cannot render any energy available, but must leave things where it found them in this respect, except in so far as loss by the scattering of energy into surrounding bodies may have occurred."

"Thus, if we decompose water by means of ignited coal, there will be just as much heat withdrawn from the apparatus by that act of decomposition as the liberated combustibles can produce by again burning. Great loss may and will occur by the transfer of heat to surrounding objects and into space, and thus the combustible gases produced, can have only a fraction of the total heating capacity originally residing in the coal" (used to produce them).

"Their convenience of application may, and in certain cases does, give them a great economic value; but this we must of course credit to its true source."

This conclusion I find to be fully sustained by Gen. Haupt's paper when its manifest oversights are correctly supplied.

HOBOKEN, N. J., Feb. 19, 1880.

[Continued from page 81.]

Gas and Gas Making.—II. *The Process.*

By L. P. GRATACAP, Ph.B.

Sulphur exists in coal gas in the form of sulphuretted hydrogen, sulphohydrate of ammonia, sulphide of ammonia, sulphocyanide of ammonia, sulphurous acid, oxysulphide and bisulphide of carbon, along with other forms not determinable, of an obscure organization, and to some extent hypothetical. These impurities are taken out in the purifiers, which are large iron boxes filled with trays on which the purifying material is laid; they communicate with each other, and are so adjusted that when any one of them is completely "fouled" it can be thrown out and again charged.

Lime is better fitted to remove the sulphur impurities than any other bodies; it seizes the sulphides, the sulphuretted hydrogen, the sulphurous acid, and attacks, partly by mechanical and partly by a chemical action, the other sulphur compounds. It withdraws the sulphur in the form of sulphides, which may become complex multiplied sulphides of lime by prolonged exposure to the impure gas, after the simple sulphide has been formed. When the formation of the sulphide of lime has been completed, whether as a mono or a bisulphide, which may be considered as produced by the sulphuretted hydrogen which predominates over the other sulphur impurities, these latter are then attacked and fastened upon the original initiative sulphide, but are less securely retained, and become detached by heat or the action in presence of moisture of the carbonic anhydride. The bisulphide of carbon, a malignant vapor, is imperfectly

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*I do not, of course, mean that the *whole* of these 8964 units per pound of carbon would be added to the *full* equivalent of carbon. What *should* be done in such a calculation I have explained further on.

arrested by lime, though crystallizable salt is to some extent made by their union and the lime sulphides assist materially in its removal. Heat changes the properties of lime as regards its power to take up sulphuretted hydrogen, and over heated lime, viz., between 110° F. and 700° F., a current of that gas may be sent, scarcely appreciably diminished in volume. The bisulphide of carbon is itself, when passing through heated lime, decomposed, and other sulphuretted compounds formed more readily attracted by the cold reagent. Bisulphide of carbon is partially removed by condensation, and the tar and hydrocarbons precipitated in that stage of the manufacture retain it. The lime is used as a hydrate before it will absorb sulphuretted hydrogen with energy. It should also be subdivided as perfectly as possible, for where used in a solid form, only the superficies of the lumps or grains are affected, and even under the best disposition the action is sensibly irregular.

Two methods are adopted in the use of lime for purification, though on sanitary grounds one has become obsolete and the other partially supplanted. The wet lime process consists in the use of hydrate or milk of lime, through which the impure gas bubbled. Thus applied the sulphides are rapidly formed, the movement of the liquor bringing new surfaces of contact to bear, and its liquid form adapting it to form a solvent for ammonia salts, and even to prolong the contact between the sulphur compounds and the lime. The gas stream should be finely divided, else it would carry through this lime bath a percentage of its impurities untouched, as the large bubbles, washed only on their outer surfaces, would retain them, and though compression in the heavy liquid tends to flatten the bubbles and so extend the surface of contact, it but very slightly counteracts the evil of admitting the gas to the purifiers through large apertures. The liquid form of lime obviates to an extent the objectionable feature of heating experienced at times in the purifiers, but under the same form it effects a reduction of the illuminants, more especially heavy hydrocarbons.

The process has been abandoned; the pressure of indignant remonstrances from citizens and health boards has compelled its surrender. The liquor, saturated with vile and poisonous bodies, upon exposure to air quickly evolved the most outrageous odors. People of delicate constitutions sickened from apprehension, simply when the carts carrying this loathsome refuse were announced in the streets near them, and so vindictive and excited did public opinion become, that the famous "blue billy," as the fouled lime was called, was incontinently abandoned after subterfuge, ingenuity, and mispresentation had successively attempted to prolong its life.

The dry lime process succeeded, and it was hoped from the easier handling of the material that many mechanical difficulties would be obviated, and the practical effectiveness be as great. This expectation was gratified; the moist hydrate answers admirably for the extraction of the sulphur compounds, admits of easier transportation and of more rapid preparation, and though probably accompanied by greater waste, owing to the aglomeration of the particles together, and, in consequence, their partial escape from exposure to the impure gas, yet it has largely, if not entirely, displaced the wet lime process. But the sanitary discomforts, though abated, were by no means abolished, and since its efficiency was greatly improved by increasing the degree of wetness, these, in many instances, were almost the same. It was continually assailed, and from this warfare two things resulted. First, the regeneration of the lime, by permitting its foul gases to escape into a washer and thence into the air, comparatively or entirely harmless; and second, a more valuable modification of the process, by using a different preparation, which had before attracted attention, but which now received the greatest impetus from its avoidance of the "sulphur nuisance."

The Laming Mixture, which finally was proposed as a substitute for the lime, is a preparation of the hydrated sesquioxide of iron with lime and sawdust, and is formed from copperas—the proto-sulphide of iron—sawdust and slaked lime.

Chemical action ensues upon its oxidation in a current of air, and an interchange of acids and bases results, the sulphate of iron is decomposed, its acid seeking the lime, which becomes a sulphate of lime, while it is converted ultimately to finely divided sesquioxide. The sawdust assists in giving porosity to the mass, and separates the particles of lime and iron The iron becomes a sulphide, and any excess of hydrate of lime a carbonate, while ammonia compounds are arrested by both, and especially in the lime sulphate, and also in the pores of the moist sawdust. Once used it admits of revivification by the introduction of air, the sulphides of iron become renewed as sesquioxides, and the sulphur deposited throughout the bulk as free sulphur.

The chain of reactions with Lanning's mixture are as follows:

(1) $3FeSO_4+3CaH_2O_2=3Fe(H_2O_2)+3CaSO_4$

Upon oxidation—

(2) $4Fe(H_2O_2)+O=Fe_2O_3+Fe_2(H_2O_2)_3$

or—

(3) $4Fe(H_2O_2)+2O=2O(Fe_2)(H_2O_2)_4$

In the purifiers—

(4) $Fe_2(H_2O_2)_3+3H_2S=2FeS+S+6H_2O$

or—

(5) $2O(Fe_2)(H_2O_2)_2+6H_2S=2FeS+10H_2O+4S$

Upon revivification—

(6) $2FeS+S+6H_2O+Fe_2(H_2O_2)_3+3S+3H_2O$

or—

(7) $2FeS+10H_2O+4S+6O=2O(Fe_2)(H_2O_2)_2+6S+6H_2O$

The regenerated material admits of being used over and over again, until the sulphur has so far accumulated as to deaden the reagents and destroy the mixture's vivacity and power. It is still, however, useful, and may be used in the manufacture of sulphuric acid, as much as 40 to 60 per cent. of available sulphur being often obtained in the heaps. When removed it does not contaminate the air by the generation of sulphur gases.

The Lanning process in a simpler form is known as "Hill's iron ore process," which adopts the same principle, using the hydrated sesquioxide of iron, which, with charcoal powder, coke siftings, and moisture, is found to form a very efficient purifier.

These iron ore methods are reasonably cheap, costing less than the lime process; but though exercising a very striking affininty for ammonia, they cannot be considered as perfect in their action as the latter. They involve, of course, the supplementary use of lime for the removal of the carbonic anhydride. The oxide of iron is really incapable of taking up other sulphur compounds than the sulphuretted hydrogen in itself, and these are only arrested upon the formation, after revivification, of free sulphur, which exerts an affinity upon these bodies to a slight though variable degree. Bisulphide of carbon is left in the gas, and nearly all the other compounds of sulphur, and, indeed, owing to the inefficient action of the iron oxide purifiers, did the serious examination of the sulphur nuisance begin.

In addition to these processes it has been repeatedly suggested that the ammonia salts in the ammoniacal liquors could be used in a caustic form for neutralizing and removing sulphuretted hydrogen and carbonic acid. Thus Evans and Sugg suggested introducing a stream of ammonia into the hydraulic main at a temperature of 200°F., hoping to unite the alkali with the sulphur and with the carbonic anhydride. The sulphide of ammonia would be formed, but it is very doubtful whether the carbonate would. Von Anaglio arranged a scheme for passing the gas through pipes filled with platinum rolls or thin laminæ of that metal, whereby the bisulphide of carbon was decomposed and the sulphuretted hydrogen set free and afterward taken up by lime. This was to eliminate that poisonous gas.

The lime methods in use have two ends in view, viz., the desulphurization of the gas and also decarbonating it, and these two actions interfere so that the certainty and extent of the lime purification is greatly diminished. Here we open one of the most interesting chapters in the history of the chemistry of gas lighting, and one which records one of its most striking advances. Theoretically adequate to liberate the gas of its sulphur compounds, yet the effect of the lime purifiers was notoriously imperfect. Sulphur existed in large quantities in the London gas, and rendered the products of combustion in the flame so offensive, from the admixture of sulphurous fumes, that its use was dispensed with in the best houses; and to avoid the damage done to fabrics, books, and ornaments, candles were substituted.

Every exertion was made to mitigate the evil, but, in spite of all the chemists did, the trouble obstinately refused relief. In 1860 complaint had become vociferous. Parliament was compelled to notice it, and the London gas act of that year enacted that unless the gas companies reduced their amount of sulphur to under 20 grains per 100 cubic feet, a heavy penalty should be imposed for every offense. It was soon found easier to fix a limit than to conform to it, and we may judge of the practical inability of the companies to answer the requirements of the law, when we find from Dr. Letheby's Reports to the city of London that for 100 testings of their gas, the Central Company's gas contained an excess of sulphur 59 times; the City Company's 34 times; and the Chartered Company's, 43 times; or, to quote Patterson's words, "In other words, if the testings had been made daily, (as is the case now) the Chartered Company, merely for one of its works, would have been liable to penalty 157 times, in each year; the City Company, 124 times; and the Central Company, 217 times.

In 1868 the penalty of £50 (about $250) a day was inflicted for an excess, and at the same time the Board of Gas Referees were instructed to carefully examine and report upon the occurrence and the remedy for this evil.

In the first place, the preposterous fact was revealed that the gas of many of the companies, upon passing through the purifiers, contained more sulphur than that at the inlet.

From an examination of the gas before and after leaving the scrubbers, the following details were obtained:

The sulphur is given in grains.

Gas Works.	Average.	Sulphur at Inlet.	Sulphur at Outlet.
Great Central Company.....	29 testings.	23.55	28.63
Imperial Company.....	4 "	24.7	24.8
City of London Company.....	3 "	22.86	25.41
Chartered Company.....	11 "	24.62	26.07

Similarly the sulphur tested at the inlet and outlet of the purifiers "at one of the largest gas works in London," showed the same anomalous increase:

Sulphur at inlet..... 21.13 grains.
Sulphur at outlet of oxide of iron purifiers..... 29.13 grains.
Sulphur at outlet of lime purifiers..... 28.46 grains.

After the most elaborate and costly furnishment, with something like twice the area of purification possessed by any other company, and after the reiterated promises of its engineers to settle the sulphur question for ever, the Beckton Gas Light Company produced a gas fouler in this particular than that of any other company in London, containing 55 grains per 100 cubic feet of the impurity. Mr. Patterson, at that time one of the Board of Gas Referees, undestook a systematic study of these perplexing accounts, and finally evolved a theory which sufficiently accounts for these contradictions in practice, and suggests as well the means and methods by which the sulphur grievance could be alleviated.

Without following the details of the successive steps which led Mr. Patterson to his final conclusions, we will simply arrange them in their nrtural sequence:

1st, Mr. Patterson detected that the oxide of iron did not appreciably affect the compounds of sulphur other than sulphuretted hydrogen. 2d, that when such other compounds were removed, it was by the action of the free sulphur in the heap. 3d, that the impure gas will readily form sulphides with the alkalies, as ammonia and soda, the latter removing almost 50 per cent. of the sulphur present. 4th, that the carbonic acid in the gas expelled sulphur from its union with lime, and thus actually added to the gas more sulphur than it held upon admission to the purifiers. "Each day thereafter the purifiying material diminished in power until it became wholly inert, and then gave off the sulphur which it had previously absorbed. This was solely owing to the carbonic acid in the gas, which disulphuretted the lime, as also the soda solution, and converted them into carbonates—the sulphur *in all forms* (*i. e.*, both sulphuretted hydrogen and bisulphide of carbon) being expelled from the lime and from the soda solution, and driven forward with the gas" (Paterson on Gas Purification). 5th, that though the gas contains far more carbonic acid than sulphuretted hydrogen, yet since alkalies had so much greater affinity for the former than for the latter, the carbonic acid could be entirely abstracted without diminishing the percentage of sulphuretted hydrogen.

From these conclusions the outlines of a satisfactory process for sulphur purification were readily deducted, viz.: first remove the carbonic acid, then form sulphides by the union of alkalies with the sulphuretted hydrogen, and then permit the gas to pass through the sulphuretted alkalies, by which means the sulphur compounds become attached to the alkaline sulphides.

The above principles indicated as well the steps and character of the process. Decarbonate the gas in the first two purifiers, the second being substituted for the first when the gas issuing from the second shows carbonic acid, the first being then recharged.

Pass the gas still laden with its sulphur impurities into lime boxes, where these are arrested in the following order: the sulphuretted hydrogen first forms sulphides, and these again remove and fasten the sulphur compounds. When the first lime box becomes thoroughly saturated with sulphur it is removed, and takes the place of the second, it becoming No. 1, to be in turn used as the second box again, for the arrest of sulphur compounds when the second box is freshly charged.

Of course this order applies to the use of soda solutions where scrubbers are substituted for purifiers, and also to gas liquor used in a similar manner. Combinations of lime, iron oxide, soda and gas liquor may be used, the sequence involved being constantly the same, removal of carbonic acid, formation of sulphides by sulphureted hydrogen, and the elimination of sulphur compounds by the sulphides thus formed. If soda solutions are employed, the first liquor on becoming thoroughly carbonated can be renewed by the use of caustic lime, and the sulphides can be revivified by exposing them to carbonic acid, which expels the sulphur as sulphuretted hydrogen, to be made commercially salable by its arrest in oxide of iron.

In conclusion, as a commentary upon the nature and importance of Patterson's theory, his own words may prove the most fitting: "By my process of purification, alkalies, whether lime, ammonia, or soda, can now be employed in such a manner as to give adequate and constantly reliable results —these substances being employed alike to eliminate the carbonic acid and to be converted by an economical process into alkaline sulphides in any required number of vessels, and thereafter maintained in that condition."

Another method of purification has been lately recommended, and the writer has seen some experiments made with apparently good results, so far as the mere fact of purification goes. This is the use of animal charcoal, a refuse from sugar refining, or in place of it, or with it, coke and coal dust. The porous mass entraps the gas and brings within its minute meshes the sulphuretted hydrogen, ammonia, and carbonic acid, which partially unite in this compulsory contact, and are also mechanically retained. This material really exerts a very remarkable influence upon the gas, and also materially diminishes its illuminants, at least at first, so as to be inconvenient from the very excess of its benefits.

With the gas purified, the theory of gas making in its chemical and abstract form ends, and the succeeding steps are mechanical, involving questions of apparatus and application, which have been purposely excluded in this brief sketch. The station meters record the yield of gas secured by the engineer from his charges; the gasometers store the product for distribution, and the street mains and services effect the distribution throughout a company's district. The scientific and practical questions connected with the use of gas are best considered under the discussion of the *product*, as a a sequel to these short papers on the *material* and the *process* adopted to obtain it. In such a connection will more closely be considered the impurities of gas, and the constitutional changes effected in its various stages of manufacture.—*Scientific American Supplement.*

Ancient Discovery of Petroleum

A dispatch from Berlin says the borings in the Hanover petroleum region are now 60 feet deep, and the existence of a basin as large and rich as any in Pennsylvania is regarded as beyond doubt by mining experts. The deepest borings already yield 4 cwt. of oil per well daily, and as the oil is becoming more and more inflammable as the bore approaches the basin, the discovery of a European oil district may be pronounced impending. The boring are exclusively in the hands of Hamburgh and Bremen firms gaged in the American trade.

It is commonly supposed that petroleum is a modern discovery; but it was known in the time of Alexander, though the ancients made no use of the find. The following is a most interesting passage:

"For a Macedonian called Proxenus, that had charge of the king's carriage (baggage), as he digged in a certaine place by the river of Oxus, to set up the king's tent and his lodging, he found a certaine fat and oily veine, which, after they had drawn out the first, there came out also another clearer, which difiered nothing, neither in smell, tast, nor savour, from natural oile, having the glosse and fatness so like as there could be discerned no difference between them; the which was so much more to be wondered at, because in all that country there were no olives." (Sir T. North, tr. of Plutarch's "Lives;" ed. 1631, p. 702.)

This passage is more than curious, for it may be useful. If there was rock-oil beside the Oxus in Alexander's time, there is probably some there still. It might almost be worth while to go and see; and if any one should there "strike oil," let him thank Plutarch foi his good fortune.—*Iron Age.*

Terrible Kerosene Accident.

DANVILLE, VA., Jan. 20, 1880.

A fatal catastrophe occurred last night six miles from this city, in Pittsylvania county. Mrs. May, an aged widow lady, living with her two daughters, one being Miss Kate May, a beautiful young lady, eighteen years of age, and the other, Mrs. Herndon, a married lady, was placing a kerosene lamp on the mantel, about 8 o'clock last evening, when it was overturned and an explosion followed. Mrs. May was enveloped in the flames in a moment. Mrs. Herndon and Miss Kate May ran to their mother's assistance, when the clothing of both took fire. The three ladies rushed into the yard. Mrs. May and Miss Kate continued to run round in a circle screaming and praying wildly for help, until they both fell dead in their tracks, completely suffocated and most frightfully burned. Mrs. Herndon had the presence of mind to fall down and roll over continually, by which means the flames which enveloped her were finally subdued, but she was terribly burned and became unconscious. The bright glare of the flames attracted a neighbor, who arrived upon the spot as soon as possible, but only in time to find Mrs. May and Miss Kate two burning corpses, and Mrs. Herndon lying on the ground unconscious. Mrs. Herndon, though still alive, is in a very precarious condition, and but little hope of her recovery is entertained.—*N. Y. Herald*, Jan. 21.

EXHAUSTION OF A MINE.—The Hood coal mine, near Liberty, Mahoning County, O., has been abandoned. Coal all worked out.

[Official Report.]

Tenth Annual Meeting of the New England Association of Gas Engineers.

Held at Boston, Feb. 18th, 1880.

The Association was called to order by the President, at 10 A.M.

On motion, the reading of the minutes of the last annual meeting, also of the last semi-annual meeting, was dispensed with.

The roll was then called, and the following members were present :

ROLL CALL.

President.

Samuel G. Sinness.

Vice-Presidents.

L. P. Gerould. Chas. F. Spaulding.

Directors.

J. P. Harbison. John M. Hill.
Chas. D. Lamson. John Andrew.
John H. Rollins.

Secretary and Treasurer.

Geo. B. Neal.

Honorary Member.

Joseph R. Thomas.

Members.

W. W. Greenough.	Isaac R. Scott.
Wm. Yorke.	William Tarbell.
Chas. F. Warren.	Gideon Wood.
A. M. Norton.	David Brayton.
Geo. D. Cabot.	C. W. Cochran.
O. E. Cushing.	Edwin Keith.
M. S. Greenough.	L. W. Wells.
David Moore.	Chas. S. Colbath.
Geo. Dwight.	W. K. Stratton.
Aaron Thompson.	Merrick Howe.
Thos. J. Pishon.	Jno. H. Burnham.
H. F. Coggeshall.	C. T. Frost.
David W. Crafts.	Geo. D. Bill.
H. A. Allyn.	J. R. Todd.
Wm. B. Durfee.	J. H. Armington.
Edwin Evans.	A. B. Slater.
Ogden Gilmor.	G. L. Manchester.
C. H. Nettleton.	Edward Jones.
Charles F. Smith.	John M. Hill.
Jas. W. Averill.	Estes Howe.
J. Q. A. Spear.	H. S. Crowell.
E. B. Yorke.	Jas. F. Rodgers.
D. T. Tilton.	

The President—We have with us to-day one of the most distinguished gas engineers in this country, Mr. Eugene Vanderpool, of Newark, N. J. He is here as a guest of this Association, and I will appoint Messrs. Gerould, Greenough and Moore a committee to wait upon him and introduce him to the Association.

The committee then retired and escorted Mr. Vanderpool to the room.

Mr. Gerould—Gentlemen ; I have the pleasure of introducing to you Mr. Eugene Vanderpool, of Newark, N. J. (Applause).

The President—Mr. Vanderpool ; It is with pleasure that I welcome you to the Tenth Annual Meeting of the New England Association of Gas Engineers ; and, gentlemen of the Association, it is with pleasure that I introduce to you one who, by his pen and by his labor, has added so much to the interests of the gas profession throughout the United States. (Applause).

We have also with us Capt. Wm. Henry White, Secretary of the American Gas Light Association, who, I hope, will take his seat with us, participate in our deliberations, and aid us as far as it is in his power to do so.

NEW MEMBERS.

Mr. Neal—At a meeting of the Directors, held last evening, there was only one application acted upon. At a meeting of the Directors, held at the Nashua Gas Light Company's office in June last, it was voted that Mr. E. B. Yorke, superintendent of the Lynn Company, be proposed. That is the only one we have to propose at this time.

On motion of Mr. Cabot, the Secretary was authorised to cast the ballot of the Association for Mr. Yorke, and he was declared to be unanimously elected a member.

ADDRESS OF THE PRESIDENT.

Gentlemen of the Association ; knowing me as well as you do, you will not expect from me, upon this occasion, an elaborate address, more especially after a remark which was made to me this morning by one who is always a self-elected critic, and who knows how it is himself, that I should not bore the Association with a long address ; and, therefore, I have eliminated from what I proposed to say a large quarto which will die unread and unknown. (Applause).

Gentlemen of the Association ; the deep feelings of my heart to which I would give expression in the first words that fall from my lips, as we meet to day in annual convention, are those of congratulation in meeting so many of our members and associates, the pleasant and harmonious condition of our Association, and the general prosperity of the various interests committed to our care ; and I greet you with a glad and hearty welcome as we come to-day to renew the memories and associations of former years. To greet each other with a fraternal welcome and sympathy, and deliberate upon the various problems presented for our consideration. To-day marks an epoch in the history of our Association—10 years of earnest, active life, years as full of important events and marked improvements as any in the history of our profession. And while it may remind us of time's rapid flight, it brings home to our minds the great thought, that "the earthly way we have to travel over" is shortened by a decade of years.

It will also bring to our minds many pleasant scenes and occasions which we have enjoyed, the gifts and favors we have received one from the other, and the many improvements which have been made, not only in the means of manufacturing gas, but in its general distribution and consumption. When the gas engineers of a few companies assembled in the city of Worcester, and laid the foundation of this Association, they "builded better than they knew," while there was in their minds no doubt of its ultimate success, and the benefits to be derived from an intimate acquaintance with each other, and an interchange of the experiences of gas engineers within our district. The history of the past and your presence here to-day attest the fact that this Association has been the means of accomplishing all that its most sanguine friends anticipated ; and its influence has extended far beyond the lines of our own New England.

As this Society was formed for the mutual improvement of its members, for the full accomplishment of its purpose all must unite in the one common object of receiving and imparting information in regard to the most practical and economical means of manufacture and distribution, in order that we may keep pace with the demand of the hour. And that demand is "Light—more light—cheaper light." And it is with pleasure that we recognise the fact that this Association has done much to awaken and quicken a new interest in our profession throughout the United States—first in the formation of the American Gas Light Association, having for its object "the promotion and advancement of knowledge, scientific and practical, in all matters connected with our profession ; the establishment and maintenance of a spirit of fraternal and social intercourse, and friendly interchange of information by the gas engineers of our entire country."

A society established and maintained upon such a basis is worthy of the attention and support of all gas companies. Other societies have been formed, having a local organization like our own, and with the same general principles of social intercourse and mutual improvement. We welcome them to our ranks, and may their numbers increase. While it may be a pleasure to meet our friends and fraters from the various parts of our land, and listen to papers and discussions from the great minds of our profession; and it enables us to get beyond the line of our own immediate concerns, opening up to us many important improvements which it would otherwise be impossible to bring to our attention ; yet the local organizations are the means whereby members are instructed in the practical management of their works. So also are associations of increased value, by the publication of papers, and discussions of the various topics presented, as they add to the literature of our profession, and will be valuable as historical records of the past.

And of no less importance is the collection and distribution of the working results of the companies within the jurisdiction of the various societies, as the publication of these results (in a tabulated form) furnishes valuable information of the practical results, and the best means of accomplishing the same. It is an interchange of experiences which many would be unable to obtain in any other way ; and I most earnestly hope that the publication of returns (for the benefit of members only) will be continued, and that additional information may be incorporated in the return for the coming year.

I doubt not that the Association will duly recognize the intelligent labor, care and attention paid to the matter of tabulation and printing of the last "statistics," by the chairman of the committee, Col. Stedman of Newport. While the publication of this return incites ambition in some to equal, and, if possible, to excel, it also awakens the go-easy from their lethargy and sleep, and throws open to each other's use many details which result to the benefit of all.

A comparison of the returns of '77 with '78 elicits the fact that some engineers have made rapid advancements, not only exceeding all others, but have exceeded themselves ; and from information which has been kindly furnished me, you will find, gentlemen of the Association, that when the re-

turns for '79 are published (which I hope may be done early in the year) results have been obtained far in excess of any previous year—more especially in the matter of yield of gas per lb. of coal, yield per man and per retort—and, in this connection, I am reminded that a few years ago our esteemed friend, the Editor of the American Gas Light Journal, Capt. Dresser, prepared and published a table, for ready reference of gas companies, giving the yield per ton of coal in feet, commencing with 9,500 and ending with with 12,500. From present appearances its usefulness has passed away. "It was too soon begun and too quickly ended," as few gas managers are satisfied with some of these figures at the present time; many companies making 9,500 the standard for the regular daily production per retort for the year. With the increased yield per ton of coal and per retort follows the amount of gas produced per day with the labor of one man, which, at the present time, ranges from ten to thirty thousand cubic feet per man. The question may be asked by some if the results, as stated by the various companies, are not accomplished by the expenditure of some equivalent. In the cases which have come under my observation they are the natural results to be obtained by the use of large retorts, skill in the manner of setting, care in management, and attention to all the details of manufacture. There are but few questions connected with the manufacture of gas, and the best results to be obtained in its consumption, which are not profitably discussed at every meeting of our Association. Perhaps not the least of the unsolved problems in the distillation of coal is the system of heating retorts, and the amount of fuel required for maintaining the most suitable and uniform condition of benches in use, and the amount of gas produced per bushel of coke consumed.

As is well known to all, many of the benches of retorts now in use are wasteful in the extreme in the consumption of fuel, and an excess of the amount required if properly applied. A matter as important as this we are glad to know is receiving the attention of the gas engineers of the country. From statements which have been made, the system of heating retorts by gaseous fuel and regenerating furnaces, in the various ways in which they have been presented, satisfies the mind that improvement lies in that direction.

So also is the manner of drawing and charging retorts worthy of serious consideration. The rapid strides made in other departments of our business leads us to hope that ere long some plan may be presented to lighten the labor and greatly improve the time required in drawing and charging retorts.

If a machine could be produced simply for charging—portable, easily handled by one or two men, applicable to works of moderate size. It would be a great benefit. The presenter of such a machine would receive the thanks of all gas men, and, I earnestly hope, a more material blessing.

There are many things which present themselves to our minds, but which are familiar to you all. As the retort house is our greatest care, so should it be our constant study, thereby enabling us to produce the maximum results with the minimum expenditure of labor and material.

Comparing the results of the present with the past, may we not anticipate that the near future may open equally important improvements, and that gas, universal as it is in its adaptation to the general purposes of illumination, may be an indispensable necessity in every household, and furnished at a price which will place it within the reach of all? For we still live in the full faith that coal gas is "the light of the future," terminating only with the supply of the material which an all-wise creator has so bountifully supplied.

There are various purposes for which gas can be made available which are yet in their infancy. There is one means of its use, which, though unheralded by any silvered pen, is silentlly and surely working its way to an acknowledged position of usefulness, as one of the most simple and economical modes of power which have ever been presented. There are two of the Otto engines in use in the city of Providence. One has been running daily since April 29, 1879, with an expenditure of 270 cubic feet of gas per day of 10 hours, and without any trouble.

The improvements which have been made by our friends in the line of heating and cooking, leads us to the belief that, with the support and assistance of gas companies, gas will be "the fuel of the future."

The generally accepted policy of gas companies has been that all duty to consumers ended at the outlet of the meter. As we have advanced in the means of manufacture so should we advance in the matter of consumption, and the various uses to which gas can be applied. Disseminating information in regard to the expense of gas for cooking and heating, and the most economical manner of its consumption. It is well known to all who have given attention to the matter that from 25 to 40 per cent. of the illuminating power of gas is worse than wasted by the use of imperfect and unsuitable burners, and an utter disregard to the regulations of pressure. While we cannot lift the vail that hides the future, the past can be our guide. Well do we remember the many, many processes which have been forced upon our attention, and which have failed, and signally failed in every respect essential to success. Whenever any plan has been presented for our investigation, having even the seeming semblance of merit, it has been faithfully examined and many plans reluctantly condemned, not only in our own line of manufacture, but for an artificial illuminator by other means and materials are, after trials and failures, still presented with an assurance and persistence, and an expenditure of time and eloquence worthy of better plans. The positiveness of the assertions, and the contempt with which suggestions have been modestly made of its failing to accomplish all that was claimed, recalls to our mind the remark made by one of New England's most celebrated writers in speaking of a critic: "He desires to impress us with the opinion that to differ from him is the full measure of absurdity." The critic is dead and forgotten, the writings of Emerson will live forever. The great asylum of oblivion is full and overflowing with dead patents—mutes of fertile imagination. None will hail with more pleasure than the gas engineers of the world the production of any means of artificial illumination.

With the important interests committed to our care, it is alike a duty we owe to ourselves and the trust reposed in us to carefully investigate everything presented, proving all, "holding fast to that which is good," and remembering that there is "nothing new under the sun," and if perchance it may be called new, that all new is not good. The gas engineers of the country have and will continue to investigate every matter presented, possessed as they are, individually and collectively, of the best scientific knowledge and practical experience, and with the earnest desire to be possessed of the most improved means and material of manufacture.

Gentlemen of the Association, as we meet to-day in the full strength of manhood, and with unbroken ranks, we are reminded of the lessons of our common mortality in the announcement which has been made of the death of one whom it was our pleasure, but two years ago, to welcome as an honorary member of this Association. Geo. Washington Edge honored alike the Association and adorned the profession. I was apprised of his death, but was unable to attend the funeral. The Association was represented by our friend Mr. Sherman, of New Haven. At a meeting of the Directors in January, a committee was appointed to prepare suitable resolutions, which have been presented. But I cannot allow the present occasion to pass without saying a word. It was my privilege to make his acquaintance many years ago. To know him was to esteem him; to be the recipient of his friendship was an honor indeed. He was a man of marked ability, of generous, noble, upright Christian character and life. Honest in the entertainment of his opinions, frank in their expression, a man of many and warm friends, he has left his mark upon the pages of our history, which will be a blessing to succeeding generations. As the old year faded away another new year was born to life. So faded away the life of our friend and frater, born to that new life, which is eternal. These brief lines chronicle his death; his eulogy is yet to be spoken.

Gentlemen of the Association, to-day completes my third year of service in this position, and, as I announced to you one year ago, it must be my last. In laying aside the duties of my official position, I by no means lose my interest in the success of this Association, or the many friends who have so kindly assisted and sustained me. Remembering most gratefully the honor conferred upon me, the kindness and courtesy ever extended, and the distinguished consideration with which I have ever been received as the representative of the New England Association.

Gentlemen, I rejoice with you in what the past has brought to us of honor or achievement, and what the future promises of success and advancement—hoping that peace and harmony may ever exist in our Association and that we shall plan and act for the good of all.

The address was received with applause.

Mr. Nettleton—Before we go any further, I think it is only fitting and proper that we should pass a vote of thanks to our President for his very interesting and able address, and I make such a motion. I would also call attention to that portion of the address which refers to the labor of the Committee on Statistics, for we all know how much time and trouble such a work involves. I have had something to do with that kind of work and know that the labor is immense. I therefore also move you, sir, that the hearty thanks of the Association be tendered to the Committee on Statistics for the able and efficient manner in which they have done the work.

The motions made by Mr. Nettleton were carried unanimously.

READING OF CORRESPONDENCE.

The Secretary then read letters from the following gentlemen, regretting their inability to be present:

Mr. Price, Mr. Wm. Farmer, Mr. C. A White, Mr. McIlhenny, Mr. Sherman, Mr. C. V. Smith, Mr. Wood, President of the Central New York Gas Engineers' Association.

He also read a communication from Mr. E. Grahns, President of the German Association of Gas and Water Experts, Essen, Prussia, inclosing

copy of the By-laws, printed copy of the proceedings of the annual meeting of the year 1878, in two parts, and a printed copy of the report of the Commissioners on coke producers.

On motion, a vote of thanks was extended to the German Society for the documents inclosed, and the Secretary of the Association was directed to reciprocate as far as possible.

TREASURER'S REPORT.

The Treasurer read his report, of which the following is a synopsis:

Balance on hand	$69 15
Received from all sources	286 78
Total receipts	$355 93
By sundry disbursements	348 20
Balance on hand	$7 73
Permanent fund deposited in savings bank	$1,000 00

On motion, the report was accepted and ordered to be recorded and placed on file.

The President—Has the Committee on Statistics any report to make?

Mr. Stedman—There is no report to make, except that which has already been received by the members. The late day at which the reports and answers came into our possession precluded our sending out any further questions. Indeed, the Committee were not authorized to send out any others. You will all remember that the matter was postponed from time to time, until finally, on the occasion of our semi-annual meeting, it was decided what was to be the course of procedure. Then, as fast as the remaining answers could be got, the tabulation was completed, and the tables were printed as soon as possible, and distributed. Before I sit down I desire to express my thanks to the Association, on behalf of myself and the Committee, for its courteous and cordial recognition of our labors.

REPORT OF THE COMMITTEE ON THE DEATH OF MR. EDGE.

Mr. Armington, Chairman of the Committee, presented the following report:

George W. Edge was an example of that prudence which belongs to an engineer who carefully weighs and examines all schemes brought to his notice; and if, upon examination, any particular plan possessed merit, or *had* in it the necessary elements of economy, his well-known energy would follow it to completion. The gas companies of this country are indebted to Mr. Edge for the successful invention and introduction of several well known devices now in common use in their works, and without which we could hardly operate our works with the present economy, or produce the results now obtained.

I think Mr. Edge was the first to lead off in the introduction of the large benches now in use, and to furnish us with the formula from which he closely calculated their production. The present compensator. which is now so universally used in this country, was also devised by him, and introduced into the Jersey City gas works, with clay retorts, in 1858. The compensator as now made is more shapely than the one devised and built from his drawings, yet its operation is not any quicker, neither is it more sensitive to a change of pressure. The drawings from which this compensator was constructed are still in the possession of the Jersey City gas light company.

The bye-pass valve, which he also constructed and introduced, in 1858, was a novelty, and worked at any desired pressure. The writer has never seen or heard of another bye-pass like the one here mentioned.

The arrangement of his governor house was, I think, original with him, and has always worked with accuracy. The adjustable tar gate on the hydraulic main was early introduced by him, and the first one made from his drawings is still extant. I am not sure that Mr. Edge was the first to introduce the adjustable tar gate in this country, but the writer saw one in use in the works under the charge of Mr. Edge in 1858.

The next invention of Mr. Edge was for the removal of carbon from clay retorts. At this point the courage and patience of our friend was sorely tried; but with that well-known energy which characterized him during his life, he persevered in his experiments, and the invention now used almost exclusively for this purpose was the result. In order that the feeling which actuated our friend in bringing out this invention may be known and understood by the gas engineers of this country, and that the modesty which always attended his actions may be appreciated, I cannot resist quoting a sentence from one of his letters, addressed to the writer in 1877, when it was intended to publish a memoir on the subject of gas engineering in this country, as exhibited at the Centennial Exhibition in 1876. He says: "The amount of carbon in clay retorts was now seemingly the greatest difficulty to be overcome; any improvement in that direction that would diminish the time required, without injury to the retorts, *would be received with favor.*" Another invention made by Mr. Edge, for the precipitation of tar by a series of fan wheels, to be kept in motion by the passage of the gas, was not fully worked up, owing to his failing health.

Our friend was not without ambition; but it took that modest form, so much to be desired in these days, and which, if it had been expressed by him, would have said—I hope that my life, labor, and the facts which I have assisted in bringing out, may lighten the labors, and prove of some assistance, to those engaged in my profession.

How different the sentiments and actions of our friend were from what are now daily experience from those who set up claims that they cannot substantiate, and who, when shown up in their true colors, seek to belittle the labors of those who have done so much towards the solution of the problems in which we, as a body, have such a vital interest. A recent writer, speaking of the labors of a friend, well describes the men whom we are called upon to meet, with their pretended discoveries, when he says: "He reflected with beautiful irony upon the exquisite impudence of those people who claim to have appropriated the truth, and to dole it out in proportionate morsels, in exchange for a subscription." The readiness of our friend to impart the valuable information he had acquired by years of careful, patient, and painstaking application to his business, the modest and gentle way in which he communicated this information, indicated him to be the quiet, genial gentleman whom we all delighted te meet, socially, in the various societies of which we were members, or at his place of business.

Of the many persons who knew our friend not one that I ever heard of spoke of him in other than terms of praise. And of the number who now hear me, that ever met and conversed with him, I think all will say that their stock of information was added too by his conversation, their confidence increased in their ability to more economically manage their business, and their admiration of the man, and the wise and common sense truths he advocated were intensified.

In the death of George W. Edge, we have lost an honest man, a genial and true friend, a kind, judicious adviser of all who sought after his counsel, and a practical and conservative advocate of the true principles of our profession.

Respectfully submitted,

JAMES H. ARMINGTON,
for the Committee.

Resolved, That in the death of George W. Edge, this Society has cause to mourn the loss of one of its honorary members, and a warm friend; an engineer distinguished in our profession for the early and successful invention and introduction of many of the present appliances now so commonly used in the manufacture of illuminating gas; who by his patient industry, unceasing vigilance, and close observations of facts, contributed much useful and scientific knowledge to our profession, and left behind him an honored name, and an example well worthy of imitation,

Resolved, That this Society desires to express the highest praise of an engineer who, in these times of excitement in our profession, has always proved himself to be a man of deliberate and well-founded opinions, and who, at all times, was ready to counsel and advise with his brother engineers, and to give them the benefit of his wise and sound judgment,

Resolved, That these resolutions be communicated to his relatives by our Secretary, and that he, in our behalf, express to them our sincere sympathy in their bereavement.

The President—We would like to hear additional remarks by the members upon this subject.

Mr. Neal—Mr. Sherman writes me that it is impossible for him to be present, but he has sent the following, which he desires me to read, and which may be taken as the remarks he would make were he present.

Mr. President and Gentlemen of the New England Association of Gas Engineers:—I regret that circumstances forbid my being present at your annual meeting, but I cannot allow the meeting to pass without adding my testimony to that of others to the great worth and excelencies of character of our departed honorary member, Geo. W. Edge.

My first acquaintace with Mr. Edge dates back to November, 1867, when, in company with our honored ex-president, Geo. D. Cabot, I called to see him in reference to his then recently patented process for removing carbon from retorts. And in regard to this invertion, I would say that if Mr. Edge had given our profession no other invention, he would have placed us all under lasting obligations to him. The almost universal adoption of his method in this country, and largely in Great Britain, shows how it has been appreciated. As long as clay retorts are used in gas works his will be a familiar name.

Mr. Edge's next great gift to us was his compensator, which was freely given, without price or money. Like other things that cost us nothing, this was never fully appreciated; but an attempt to get on without it would soon demonstrate its great value. About ten years ago Mr. Edge entirely rebuilt the Jersey City Gas Works, from plans of his own maturing, and they are a works to-day that any engineer in the old or new world may be justified in feeling proud of. In the rebuilding of these works his wonderful mechanical talents had full sway.

These works represent the great industry, deep thought, winnowed ex-

perimets, and patient observations of one of the greatest geniuses that has ever adorned our profession; and no greater compliment could be given their designer than the fact that no gas works in the country have been visited so often, and by so many different engineers, from all parts of our land, as Mr. Edge's. They have been the model works.

He was among the first, if not the first, to introduce benches of sixes. He was the first to build benches of the capacity in common use at the present time. All of which has resulted in a great reduction in the cost of producing illuminating gas.

He was the first to see the necessity of and to adopt the necessary means for reducing the seal in his hydraulic main. So I might go on, and enumerate all the apparatus used in gas works; under his magical touch they performed more and better work. No one could converse with him but for a few minutes on the subject of our manufacture without feeling they were in the presence of one who spoke by authority—the authority which comes from a thorough mastery of the subject under consideration. He was ever ready to impart information, to give of his large experience, and to throw open his works to those who were seeking information. He was possessed of great prudence and sound judgment, and a genial temperament which endeared him to all his associates. I never met him without feeling the quickening influence whith is imparted by men of great endowments and force of character. I was always lifted to a higher plane of professional life, always came away feeling I could make two blades of grass grow in our business where only one grew now.

I will close with the following extract, taken from the American Gas Light Journal. In noticing the death of our eminent gas engineer, they summed up a brief notice of his life in the following well-merited sentences:

"He had, indeed, every title to respect. There was not a grain of guile, jealousy, or ill-nature about him. A fine specimen of a Christian gentleman at once in appearance and character. He fought the battle of life with honor, ability, courage, and energy, and, we are happy to say, with conspicuous success; while his personal qualities—the ever-ready smile, the nice word, the chivalrous kindness—endeared him to countless friends, as they have done to the writer, who will long regret that his sun should have gone down while it was yet day."

F. C. Sherman.

Mr. M. S. Greenough—I do not think it is proper that this report of the Committee, with the accompanying resolutions, should be acted upon without some expression of sentiment from gentlemen residing in this part of the country. Those of us who live in this vicinity have not been so fortunate as the gentleman who read that report, in having an intimate personal acquaintance with Mr. Edge; but we all recognize the distinguished services he has rendered to his profession, and those of us who have had the pleasure of meeting him can testify that we have never received from Mr. Edge anything but great courtesy, and kindness; and the readiness and cheerfulness with which he threw open the result of his long experience to the profession, gained him the respect of everyone. I shall heartily vote for the adoption of the report and the passage of the resolution, but I shall do so with a feeling of the deepest regret that we, as an Association, should have been called upon to take such action for yet many years to come. (Applause.)

The President—I desire to add one word to what has been said upon this subject. The reading of Mr. Sherman's remarks recalled to my mind the fact that some seven or eight years ago Mr. Neal, Mr. Cabot, and myself, and, I think, some three or four other gas engineers, accidently met at Mr. Edge's works. It was a most positive agreement that we were to leave at 12 o'clock; but 12 o'clock came and passed, and the shadows came before we left. We were completely impressed with the wise counsel and the experience of Mr. Edge, as we never had been impressed before. It was a perfect dissertation upon the distillation of coal and its products, and we came away well repaid for the time we had spent in his company.

There was also another point in his character which I am sure none of us will ever forget; and that was the genial hospitality which was always extended to gas men whenever they crossed his threshold; and I have never pessed through Jersey City since that time without my heart growing warmer and my eyes dimmer as I remembered the generous hospitality extended to us on that occasion. It was a day never to be forgotten. Mr. Edge has placed a mark upon the records of our profession, and of our country, which will be a blessing to future generations. I am sure Mr. Neal and Mr. Cabot will confirm all that I have said.

Mr. Neal—I am glad to allude to the meeting that we had in Jersey City at Mr. Edge's works. It was altogether unpremeditated. We spent a very delightful day. He delivered a lecture, I might say, which was exceedingly interesting and instructive, and we enjoyed it very much. I shall always look back upon that occasion with feelings of the greatest pleasure, mingled with the deepest regret at the loss our profession has sustained.

Mr. Cabot—I trust, Mr. President and gentlemen of the Association, that you will excuse me for not speaking upon this subject, as I am not prepared to make any remarks this morning. I can only say that I most heartily endorse every word that has been said in regard to Mr. Edge's character.

The President—We have one present with us this morning who knew Mr. Edge well, and I am sure we shall all be glad to hear a word from Mr. Thomas.

Mr. Thomas—I do not know, Mr. President, that I can add anything to what has already been said. It was my very good fortune to have known Mr. Edge for something like 28 years. One thing that made Mr. Edge so eminent in his profession was that whatever he undertook, he *did*. He was not carried away with flighty notions and ideas; but everything was the result of careful calculation. When Mr. Edge put a charge in his retorts he knew precisely what quantity of coal ought to go in, and what production he ought to get and he got it. He expected to furnish good gas, and to get all the gas out of the coal that he ought to get, and he got it. It was our privilege to see him at the meeting of our organization once a month. His connection with us was of the most pleasant and delightful character. He was always a cordial, genial gentleman; and, as has been said here, was always ready to talk over matters connected with his profession, and to give an opinion when asked, and a sound, substantial opinion it always was.

It is often the case that men who are young in our profession, and, indeed, in any profession, know more, or think they do, than the old fogies who have grown gray with years of labor and experience. So far as I am personally concerned, although I have been in the gas business for the last 30 years, it is an actual fact that I know less than when I commenced—I mean less than I then thought I did—and I find, constantly, that there is something more to learn. In the strides that have been made in the manufacture of gas, we all of us, doubtless, remember, in our experience, how we adopted some new plan expecting it would probably be a failure, but hoping through failure to at last achieve success. But this was not so with Mr. Edge. Everything he did was the result of the most careful consideration and calculation; and when his works were put up and completed, the result showed that the most thorough and careful calculation had been made.

At our monthly meetings subjects come up for consideration. Mr. Edge was never a very demonstrative man. He was very quiet in his ways, but he always put in a word in good season. You could talk with him upon any subject, and you would find that he had given it careful consideration.

I can only express the hope, gentlemen of the New England Association, that when we leave this world we will each of us go out of it with a record as good as that which Mr. Edge has left behind him.

Capt. White—I did not come prepared to make any remarks upon the subject of Mr. Edge's death, but learning that a resolution was to be offered this morning, and that remarks would be made, I am desirous of an opportunity of adding a word to what has been said. I do not wish to inflict a speech upon the Association, or to take this occasion of wearying your patience by a formal address upon the subject of the late Mr. Edge, for, while I have not heard the remarks that have been made, yet, learning the names of those who made them, I know that nothing I may say can add to the effect of what has already been said; but I wish to avail myself of your courtesy to lay, as it were, one flower upon the casket of my late friend—for he was my friend, and my father's friend. I feel bound in justice to embrace this opportunity of saying a word touching his manly character, and the great loss we all admit his death to have been. I knew Mr. Edge from my early boyhood, and some of the earliest and most pleasant recollections in connection with my profession, and of hours that were spent literally sitting at his feet, learning and gathering from the immense stores of knowledge that he possessed. I do not know, Mr. President, of any man who ever graced our profession who was at once more full, and yet more modest in his fullness, than George Edge—a man to whom the entire profession is indebted for many wise suggestions and many valuable discoveries; a man who, with it all, was more simple and childlike than the veriest tyro among us. I know of no man who talked more merchantable literature upon the subject of our profession than George Edge. No one could be in his presence, even were it but for a few minutes, without feeling that he had met a man thoroughly master of himself and his knowledge. I will not take up your time for a moment in speaking of him as a citizen, for Jersey City mourns him in that capacity; nor will I speak of him as a charitable man, for his charity found its way into many byways and unthought-of streams, and reached and benefited many the public never knew, for, like the man himself, his good deeds were only equaled in effect by the modesty of their doer. Neither shall I stop to speak of him as a Christian gentleman, for that was unmistakably stamped upon him. No man could see George Edge, no man could be with George Edge, and not be impressed with the fact that he was, in the best sense of the word, a Christian gentleman; but I do desire to lay at his feet, and upon his coffin, the grateful tribute of one who grew from boyhood into manhood enriched by his stores of experience and knowledge. I feel it is but just to him and to myself to say how much I am personally indebted to him. If in any sense I repre-

sent the American Gas Light Association, I say for the members of that Association that his loss is universally felt as an irreparable one, to be deeply deplored; for as a gas engineer he was preeminent. I do not think, Mr. President, that any man among us, who has ever spent an hour in the gas works at Jersey City, can feel that he did not come away better fitted to discharge the duties of his profession. Hospitable, he was genial and kindly, not only with the coin that he dispensed from his pocket, and the hospitality that took the form of food and drink, but he was equally generous with the hospitality of his mind. Whatever he knew was at my service and at yours. Every man who came to him and said he was a gas man, was invited to sit at the table of his intellectuality and to help himself freely at that repast. It does seem to me, sir, that we never should allow such a man to pass from our midst, leaving such a breach as he has left in our profession, without stamping indelibly upon the records of all such associations as this our high appreciation of him, for while the mediocre man is plenty, the man of genius is rare. There are men who seem gifted by Providence, and placed in a particular sphere for the benefit not of that circle alone but for the benefit of the whole world. I believe I say nothing extravagant when I state that George W. Edge, in living in this world, has benefitted it. No man can say he is poorer, or has been robbed of anything, because George W. Edge lived; but, on the contrary, every gas man feels that he has lost a part of himself, that something he could not replace in his own nature has passed away with this genial and gifted man—this man who never grew old, but who, while the years multiplied and the snows whitened upon his head, was ever a genial boy at heart.

I thank you, gentlemen, for the opportunity you have given me to place upon the records of this Association the expression of my deep feeling at the great loss we have all sustained by his death. (Applause).

The President—As a mark of respect to the memory of our deceased brother, I would request that the vote upon this resolution be taken by rising.

The report was adopted, and the resolution passed by a rising vote.

[To be continued.]

[Official Report.]

Third Quarterly Meeting of the Central New York Gas Engineers Association.

Held at Rochester, N. Y., Thursday, February 19th, 1880.

The Third Quarterly Meeting of the Central New York Gas Engineers Association convened at the Brackett House, Rochester, New York, on Thursday, February 19th, 1880.

The meeting was called to order at 11 A.M., the President, A. C. Wood, in the Chair.

The following members were present:

A. C. Wood, Syracuse.	W. Parrish, Seneca Falls.
J. McDougall, Hornellsville.	R. J. Dobson, Waterloo.
F. D. Kingsbury, Corning.	W. Cartwright, Oswego.
P. Clark, Oneida.	J. H. Findlay, Ogdensburg.
W. Humphrey, Dansville.	M. Harrington, Niagara Falls.
W. A. Wood, Syracuse.	L. C. North, Canandaigua.
C. A. White, Rochester.	

The minutes of the last meeting were read and approved.

The Secretary presented the applications of Messrs. W. H. Scrafford, of Bath, and A. E. Cole, of Corning, for membership in the Association.

Mr. Findlay, of Ogdensburgh, was appointed teller, and the Secretary directed to cast the ballot of the Association in favor of the admission of both applicants, which was done, and the teller reported the unanimous election of both gentlemen.

The President mentioned the fact that both the Secretary and himself had received invitations to be present at the Tenth Annual Meeting of the New England Association of Gas Engineers, in session at Boston; characterizing it as an intended compliment to this Association—that its officers should be invited to the "Tin Wedding" of the New England Association, and suggested that the Secretary send a telegram of congratulations which he did, as follows:

Rochester, New York, Nov. 19, 1880.

S. G. Stiness, President N. E. Association of Gas Engineers—
Young's Hotel, Boston, Mass.,

The Central New York Gas Engineer's Association, in solemn conclave, shout greetings on your tenth birthday.

May they strike pleasantly upon the tin-pan-um of your anniversary ear.

Clem. A. White,
Secretary.

The regular order of business was then taken up.

Mr. D. M. Dunning, of Auburn, read the following paper on

Gas vs. Kerosene Oil.

I consider kerosene oil the only competitor we have, except, perhaps, tallow candles and electricity, which I regard as of about equal importance.

Kerosene oil has bothered us a great deal at Auburn, and still continues to bother us, for I would not have you think that we have yet vanquished the enemy. If you were to visit Auburn you would find, as soon as you leave our principal street, a great many stores burning kerosene; but, I am happy to say, that we have a great many more consumers than we had two years ago, and our annual make has increased in two years from 14,000,000 to 20,000,000 feet. About one-half of this increase, however, is due to increased street lamp consumption, and the other half to general customers.

I looked the matter over carefully about two years ago, and made up my mind that as much light could be obtained from one dollar's worth of gas, at three dollars per thousand, burned under the best possible conditions, as from one dollar's worth of kerosene oil, provided a proper allowance be made for labor and breakage occasioned by burning oil. I found that a great many of the old burners then in use were in very bad condition, and generally wasting from 25 to 60 per cent. of the gas they passed; so that the first thing to do was to get the best burners that we could find. After experimenting with and testing a great many of these, we finally settled on the Evans burner, which gave as good results as any for the amount of gas consumed, and had an advantage over all others in that it was adjustable from the outside, in a plain practical manner, not liable to get out of order. These burners can be adjusted, after they are put on, to burn anywhere from three to eight feet per hour, by simply turning a screw in the base of the burner.

We laid in a stock of them, and also of the white opal globes, open at the bottom. The burners cost us 15 cents each, and the globes 25 cents, and we advertised them and furnished them to our customers at cost. We went about from store to store, among parties burning kerosene, and asked them how much they could afford to pay to have their stores lighted with gas. They almost invariably admitted that they very much preferred gas to oil, and generally named a fair price per month, which we would agree not to exceed. We would then fit up the stores with our globes and burners, and adjust the burners from three to four feet per hour, and the result was almost invariably that we kept the customer.

I regard these opal globes as of the greatest importance to gas companies. With a perfect burner, passing four feet of gas per hour, and one of these globes, more light can be obtained for business purposes, or for the family circle, than from three or four times that amount of gas, with such burners and globes as were in general use a short time ago, and, I presume, in many places where gas companies have not given proper attention to it, are still in general use. Since we commenced introducing them some two years ago, we have supplied our customers with about 2000 globes, and 4000 burners, and if we had supplied them for nothing, it would have been the best investment we ever made. We are still sending them out, having recently laid in a large stock of them. The improvement in the general appearance of the stores where they are in use is a source of great gratification, and it is certainly a beautiful sight, especially to a gas man, to see an elegant store brilliantly illuminated with gas of from 18 to 20 candle power, burning under the best possible conditions.

Such a store, doing business alongside a store burning oil, presents such a marked contrast, and has such decided advantages, that the oil man soon wants to get gas too, and, if properly approached, you can generally get him for a customer.

I regard it as the duty of all gas companies to see that their customers get the greatest possible amount of light, for the least possible amount of gas consumed, and think that therein lies their strength in fighting kerosene oil.

Quite a number of questions were asked of Mr. Dunning in regard to the relation of the company to their consumers, and whether bills exceeded the amount agreed upon.

Mr. Dunning stated the bills seldom exceeded the amount agreed upon, and they had not lost a single consumer.

Mr. W. A. Wood, of Syracuse, then read the following paper on

The Use of Water in Ascension Pipes.

At our last meeting, the statement was made that an adequate remedy had been found for freeing, and keeping clear, the stand pipes in our retort-house.

The necessity for some such remedial agent is generally acknowledged by those running with high heats; and from the interest manifested in this matter, in August, it was thought a more elaborate account of our operations might not prove unacceptable to the Association.

The method adopted was brought to our notice, in May last, by the Supt. of the Homer and Cortland works, whose foreman had been experimenting and had derived much benefit from the use of water, either evaporated from

an iron vessel, placed within the mouthpiece, just before sealing the retort, or introduced above through a syphon, and allowed to trickle down the inside of the stand pipe. We have since learned that the use of water in either manner is by no means novel; but the idea was certainly original with the gentleman mentioned above, and the general surprise at the simplicity and efficiency of this "water cure," expressed by those present at our August meeting, proves that the system is not very widely known in this section of the gas world at least.

Mr. Jones, the superintendent of the South Boston works, in a communication to the AMERICAN GAS LIGHT JOURNAL of October 2d, and in subsequent correspondence on the subject, affirms that he employed a similar method for relieving his pipes so long ago as 1851, and further states that he found no evil effect arising from its constant employment, although not using it at present, as he finds relief through petroleum residuum which he uses as an enricher.

Wherever the honor of discovery or invention may properly belong, our experience has convinced us that the judicious introduction of water inside the pipes can be unequivocally commended. Different methods of applying the water may suggest themselves to different engineers. With us, the main water supply-pipe is run along the front of the stack, and wired to the stand pipe just below the flange connecting the ascension and bridge pipes. A pillar-cock is introduced at the center of each stand pipe, and below this a syphon is tapped through (fair with the inside of) the stand pipe, having sufficient seal to overcome any back pressure in case the exhauster is shut down.

The syphon is of ¼-inch pipe, capped with a ¾ reducing coupling, which serves as a funnel to receive the water from the pillar-cock above. The funnel is placed, say, three inches below the cock, permitting the flow of water to be observed from the floor below. The water is introduced drop by drop and, with a little care, the amount may be so adjusted that it will moisten the entire length of the longest pipes, and still be nearly, if not entirely dissipated, before reaching the mouthpiece. The tar, as it collects, finds no foot hold on the moistened surface of the iron, and, like water from the traditional goose's back, slides down into the mouthpiece, where it is easily cared for.

Our stoppages, previously common to all the pipes, and most frequent and obstinate in those leading from the upper retorts, after the water was turned on, occurred only in the pipes connecting the lower retorts and just above the mouthpiece. The obstruction consisted of a mixture of tar and dry carbon, and gathered very rapidly after the charge. A cylinder-shaped reamer of steel, four inches in diameter, with a cutting edge on top, was substituted for our ordinary stand pipe augur, and this introduced into the mouth of each pipe before charging, together with the water dripping in from above, has banished the bug-bear stopped pipes from our works.

Several difficulties were apprehended from the contact of the hot gas with water at such an early stage of the process; but a thorough test has proven them all imaginary.

Providing a free passage for the gas, and obviating the frequent removal of lids, an increased yield necessarily followed. With old benches, and a portion of coal partially damaged by fire, the yield for May was 4.85. With no other condition changed, other than the introduction of water, the yield for the succeeding month of June was 5.09, and there was no appreciable diminution of candle-power. The heat of the stand pipe is ample for vaporizing the water, and, with moderate care, a dangerous quantity need never reach the retort. The vapor is doubtless returned to the main, and condenses as water, there being insufficient heat to decompose the steam so that liability to surreptitious production of water gas, and its concomitant, carbonic oxide, is not imminent.

Again, so small a quantity of water cannot materially affect the temperature of the gas, and naphthaline deposits, which were with some reasonableness anticipated, have not appeared.

With us much trouble is experienced in purification from the nature of our water. Containing, as it does, a large percentage of lime, a calcareous deposit results from its union with the sulphur in the gas. This limey product accumulates very rapidly in the chambers and overflow of the washer.

We apprehended the most serious objection to the use of this water in our stand pipes, fearing a deposit that would be even more refractory than the tar; but the incrustation, if any, forms so slowly that we have, as yet, been unable to find it.

After a six month's trial of this method of relieving our pipes, we can find nothing that militates against it, and have adapted it to all our benches. The change in the retort house is marked.

Fourteen lids off in five hours—a wood fire burning around two standpipes—melting milesians ramming red hot irons down from above in others—encouraged by all that official vituperation could accomplish—was a typical morning's experience in May last.

Now, with tar fires burning off from 1600 to 2000 in five hours, lids are never removed except for drawing the charge. A Sabbath-like quietude pervades the retort-house between charges. The necessity for professional expletive no longer exists.

[To be continued.]

Iron Sponge Material for Purifying Gas.

OFFICE OF CONNELLY & CO.,
272 LIBERTY STREET, PITTSBURGH, PA.

To Gas Companies and Gas Engineers—

Gentlemen: Our object in addressing you through the columns of the AMERICAN GAS LIGHT JOURNAL, is to call your special attention to the subject of our "Iron Sponge Material" for purifying gas. Everything we claim for it—and we claim that it is vastly cheaper, cleaner, as effective, more agreeable, and of much less labor to handle than lime—is fully corroborated by the engineers in charge of every works where it has been introduced.

In comparing our material with lime, as to the amount it purifies per bushel, we trust it will be remembered that a bushel of quick lime is almost equal to two bushels when slaked; therefore, the amount purified per bushel of lime should be counted at half, or else the amount per bushel for our material should be doubled, or nearly so.

Another great advantage is that our material, being very porous, offers less resistance to the passage of gas; a greater quantity can be put into the boxes, consequently they will run longer, and lessen the labor of as frequent changes as where lime is used.

We respectfully ask your careful perusal of the following letters, which are only samples of what we are getting from every works where our material is in use:

ALLEGHANY GAS WORKS,
ENGINEERS' AND SUPERINTENDENTS' OFFICE,
ALLEGHANY, PA., February 25th, 1880.

MESSRS. CONNELLY & CO.,

Gentlemen: Yours of the 18th inst., came duly to hand, contents noted; and in reply would say that we have been using your purifying material for some months, and it is giving us entire satisfaction. The last box we emptied purified 10,381 feet per bushel. The first time we used it, it only purified 1600 feet, the next time a little more, and so on, until it got up to the above statement, which is the highest, but the average will be over 8,000. So far, we have been able to keep our gas free from carbonic acid, testing it by the ordinary test. You claim that it will last from two to three years, but if it lasts me 18 months I will be very well satisfied.

Yours truly,
ROBERT YOUNG,
Engineer and Superintendent.

OFFICE OF THE WEST PITTSBURGH GAS LIGHT CO.,
PITTSBURGH, PA., February 17th, 1880.

MESSRS. CONNELLY & CO.,

Gentlemen: We have been purifying our gas with your Iron Sponge Material since Feb., 1877, and have been at *no expense* for lime or additional mixture since that date.

We find it as effective as lime, cleaner, more agreeable to handle, and a great saving in labor. Its use has verified all and more than you claim for it.

Yours Respty.,

S. H. FRENCH, *Secy. and Supt.*
BERNARD YOUNG, *President.*

In addition to the foregoing letters, we refer to the following engineers and officers of gas companies now purifying their gas with "Iron Sponge Material":

Pittsburgh Gas Light Co.,		Pa.,	John H. McElroy, Engineer.
So. Pittsburgh	" "	"	S. M. Robinson, President.
Sharpsburgh	" "	"	A. J. Riescal, Engineer.
Monongahela City		"	W. M. Lowrie, Supt.
Beaver Falls	" "	"	S. S. McFerran, Supt.
New Castle	" "	"	O. H. Shiras, Supt.
Salem	" "	Ohio	Allan Boyle, Pres. & Supt.
Bellaire	" "	"	C. H. Strahl, Supt.
Logansport	" "	Ind.	E. S. Rice, Manager.
Hannibal	" "	Mo.	J. H. Decker, Supt. and Eng.
Covington	" "	Ky.	R. Salter, " "
Macon	" "	Ga.	A. E. Boardman, Supt., etc.
Rochester	" "	N. Y.	C. A. White, Supt. and Eng.
Fitchburg	" "	Mass.	H. F. Coggshall, Treas. and Supt.
Sioux City	" "	Ia.	Horace Decker, Supt.
Etc.	Etc.	Etc.	Etc.

Very respectfully,
CONNELLY & CO.—*Adv.*

Correspondence

[We are not responsible for the opinions expressed by Correspondents. Correspondents, in all cases, should sign their communications with their names and address in full—not for publiction, unless desired, but as a guarantee of good faith.—ED.]

Gas for Heating and Cooking—Is is Practical.

The use of gas as a fuel for domestic purposes has long since ceased to be a novelty. On the other hand, there is abundant proof that under limited conditions it is a cheaper fuel than coal, and from its great convenience, a public need. Nevertheless it is true that few use it for that purpose, and that there is a prejudice in the community against such use.

Believing that this prejudice is entirely without reason, we propose here to inquire why it exists, and how it can be removed. And as in introducing any innovation upon old uses success is frequently hazarded, and always delayed, by attempting too much, we will confine the inquiry to the use of gas stoves for summer cooking in small houses, or suites of rooms, where the use would be temporary and a coal stove is a great inconvenience.

Firstly, then, for such use is gas a cheaper fuel than coal? Without referring to the many experiments which have been made to prove that it is, we think the following practical statement will satisfy any reasonable person to whom proof is given that it is true:

There are now simple, durable, and cheap gas stoves, which in one hour's operation will cook and place hot upon the table four dishes, and use only 12 feet of gas, or eight dishes, and use 24 feet of gas, costing (at $2.50 per 1000 feet), in the former case, 3 cents, and in the latter 6 cents. For the same work a coal stove is not as cheap, and even if it were the annoyance from using it in hot weather and in close rooms would give the preference to gas.

It will be noticed that in making the above statement we assumed that to give it effect it must be proved. And here is the gist of the whole matter, and the objective point in this paper, to wit: To inquire how the public can be convinced that gas is a practical and cheap fuel, and why such fact, if it is a fact, has been so long kept in obscurity.

In answering these questions we say without hesitation that the responsibility involved in them rests with the gas companies. The statement we have made above, as to the advantage of gas as a fuel, they all indorse, and yet they do little or nothing to convince the public of it. Nay, many of them so damn their approbation with faint praise, that the inference is irresistable that they have little interest in it. For instance, if we go to the large city companies, where the field for a limited use of gas is extensive, we will be told that they always recommend the use of gas for cooking, but that people are prejudiced—in fact, that before anything in that direction can be done the public must be educated. In the meantime any one can buy a stove and satisfy himself, etc., etc. Suggest to them that in the present state of the public knowledge upon the subject people will not buy stoves, and that, as the gas companies are the parties chiefly interested, it is they, and not individuals, who should educate the community by public tests, and by making cooking and heating a department of their business, and, "a ducat to a scruple's worth," they will tell you that dealing in gas stoves is not their business.

Is it not? Let us inquire. We will suppose a gas company selects two or three kinds of good gas stoves, which will cook a breakfast or dinner for a small family at a cost of from 3 to 5 cents (and, to our knowledge, there are such), puts them up in its office in connection with a test meter to indicate the amount of gas used, and from time to time makes practical tests of what they will do. Suppose, further, it notifies its customers of this action, and afterward sends a proper person to a selected number, authorized to inform them that the company, if desired so to do, will furnish and put up for them gas stoves without charge, except a small monthly rent, and will look after their operation when they take a statement of their meters. All this can be done at small expense, and, as it involves no cost to the consumer, and does not burden him with any responsibility, is it not evident that many of them thus applied to will at once accept the offer made them, and, as soon as they experience its advantages, will use the stoves generally? And is it not equally evident that, a commencent being thus made, a more extended use must follow in time?—especially in large cities, in several of which even now schools are formed to teach people of moderate means the advantages of cooking with gas. But can gas companies afford to incur this trouble and expense? We will see. A stove for the above limited use can be put up by the company at a cost of $10, including the oven, boiler, flat-iron heater, and connecting tube—as they can easily ascertain by proper inquiry—and will rent for 25 cents per month. Now, for a little while, perhaps, the average use will be less, but as soon as the experiment is fairly under way, five months' use in the year for such a stove is a reasonable assumption. That would make its average rent $1.25, which is sufficient to pay legal interest at six per cent. on the investment, and leave 65 cents for wear and tear—a more than ample sum if the stove is made of cast iron, as it should be.

Then what is the situation? The rent taking care of the investment, the only burden on the company is its collection, and for that they have intact the profit on the extra gas used, which every gas engineer knows is very large, the cost of such gas being little more than the value of the coal and lime used to make it.

But even assuming these premises, the gas companies may say, we need something more. Will parties use these stoves when there is no obligation upon them to do so? And what guarantee have we that lessees will take care of them (there being no penalty for neglect), and return them when required to do so? To these objections we reply, that if there is no use, there is no wear and tear, while the rent continues, and that if durable stoves only are furnished, neglect cannot injure them beyond what the rent pays for. Further, that the company is under no more obligation to furnish stoves to irresponsible parties than they are now to furnish light, and can guard against one as well as against the other. And finally, if it is urged that five months' use is too high an average, certainly four is not, and even that will sustain the argument. But this admission is entirely gratuitous, if the stoves selected are so arranged that they can be used for heating rooms in winter without extra cost—an entirely practical thing, as it is already done.

We have now given, we think, a fair and candid review of the causes why gas is not more generally used as fuel, and why the responsibility for that neglect rests upon the gas companies. From this indictment they cannot escape. It follows even from the very premises upon which they attempt to justify their inaction—as if educating the public is a necessary condition to secure public use, and that use when once secured will yield a great profit. The parties to act are the parties to be benefited, and they are the gas companies. No private dealer has sufficient inducement to furnish stoves on rent, and, while the business is in its infancy, no other system than that will succeed. We know this from our own experience, as we made the experiment and found that, while everybody was interested—was willing to try a stove upon a rent—it was a rare exception when parties were willing to buy. That was the result in that case, but however conclusive the evidence it afforded was to us, its weight is little when compared with the experience of gas companies in England and France. There gas is sold at 75 cents per 1000 feet, yet before the companies could induce their consumers to use it to any extent for cooking, as they now do to a very large extent, they were obliged to adopt the system recommended in this paper, to wit, the company to furnish the stoves at its own cost, and upon rent. And if such was their experience, is it not marvelous that gas companies here, with their superior advantages, cannot perceive that if they expect to extend their business in the only direction open to them, to wit, adding to it cooking and heating, they must abandon their present apathy, and do as others do when they desire to interest the public. They are no exception to the operation of general laws. They have no royal prerogatives. The time has passed when excessive profits excused indifference. Ah! that golden time, when to be an officer of a gas monopoly was to be a king throned in idleness and steeped in adulation! Verily, the change to this practical age, when something is never had for nothing, and success is to be gained only from labor, is great indeed. For officials spoiled by prosperity it is a hard lesson to learn; but it must be learned, or our gas companies must go to the wall. They must wake up to the discovery that they are no longer a fuedal monarch, with undisputed sway, but a king—if still a king—who must fight for his throne. And every day the situation becomes more serious. Already there are millions of oil stoves in use in this country, and now steam threatens further rivalry. In several of our large cities companies have been formed to introduce it into private houses, and a chief reason why they have been encouraged by the public to do so, is the facilities it would afford for cooking. How far that system is practical we do not know, but to assume that it is not, is a very weak reason for our gas companies ignoring it. It is sufficient that it threatens a very dangerous competition with their business, and if they are wise they will guard themselves in time by occupying the field before their rivals can seize upon it.

As a conclusion to this paper, we finish our argument with the following question: Among all the gas companies in this country, is there one having enterprise enough to give the plan above illustrated a fair trial? At present we know of none who have already adopted it.

H. Q. HAWLEY.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)

24 PINE STREET, NEW YORK CITY.

MARCH 2, 1880.

☞ All communciations will receive particular attention

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid.	Asked.
Gas Co.'s of N. Y. City.				
Central	466,000	50	44	50
Harlem	1,800,000	50	42	47
" Bonds	170,000			103
Manhattan	4,000,000	50	160	165
Metropolitan	2,500,000	100	118½	121½
" Scrip	$1,000,000		95	100
Mutual	5,000,000	100	55	60
" Bonds, go'd	900,000	1000	95	100
Municipal	1,500,000	100	165	175
" Bonds	750,000		106	110
New York	4,000,000	100	99	101
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	116	120
Citizens	1,200,000	20	55	60
" S. F. Bonds.	320,000	1000	100	105
Peoples	1,000,000	10	25	30
" Bonds.	290,000		90	95
" Scrip	250,000		75	85
Metropolitan	1,000,000	100	60	70
Nassau	1,000,000	25	50	55
" Ctfs.	700,000	1000	85	95
Williamsburgh	1,000,000	50	70	75
" Scrip			97	101
Kings Co	135,000	100	—	50
" Bonds.	40,000	—	—	—
Union Co. E. N. Y.		25	—	50
Richmond Co., S. I.	300,000		—	85
Out of Town Gas Companies.				
Bath, Maine	70,000	100		
Buffalo Mutual, N.Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md	2,000,000	100	95	98
" Ctfs., gold	1,000,000		—	103

Bayonne, N. J.....		100		90
Brockport, N. Y.....	25,000	100	...	80
Citizens, Newark.....	918,000	50	92½	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.				190
Derby of Conn.....	160,000	100	60	80
East Boston, Mass...		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.....		100	...	—
Hannibal, Mo.....	100,000	100	95	100
Hartford, Conn.....	700,000	25	120	125
Hempstead, L. I.....	25,000	100	...	—
Halifax N. S.....	400,000	40	148	150
Hamilton, Ontario...	150,000	40	117½	
Jersey City	750,000	20	140	145
Jamaica, L. I.....	25,000	100	...	—
Jacksonville, Ill.....	120,000	50	100	...
Lewistown Maine...	400,000	100	70	80
Laclede St Louis Mo.	1,200,000	100	100	105
Long Branch.....		20	30	40
New Haven, Conn...		25	120	140
Peoples, Jersey City		...	40	50
" " Bds.				95
Peoples of Albany...	650,000	100	—	10
" Bonds	350,000	1000	—	—
Peoples of Baltimore		25	80	84
" Bonds....			106	—
Plainfield, N. J.....	80,000	100	—	105
Perth Amboy		25	—	95
Pittsfield, Mass.....			120	130
Rochester, N. Y.....		50	70	80
" Citizens		100	50	60
Rondout & Kingston			75	80
St. Louis Missouri..	600,000	50	300	—
Stillwater, Minn.....	50,000	50	—	26
Saugerties, N. Y	15,000	100	95	100
San Francisco Gas-Co., S. Fr'sco Cal.			81½	82½
Toledo, Ohio.....			95	97
Troy, Citizens.....	600,000	100	—	60
Washington, D. C...	1,500,000	20	170	185
" Scrip	500,000	20	100	110
Woonsocket, R. I....	150,000	100	80	...
Wilmington, Del....		50	174	...
Yonkers.....		50	—	70

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NOTICE OF DISSOLUTION.

NOS. 1115 AND 1117 CHERRY ST.,
PHILADELPHIA, Feb. 25, 1880.

On the 1st day of January, 1880, the firm of HARRIS, HELME & MCILHENNY, Gas Meter Manufacturers, was dissolved by mutual consent, by the retirement of WASHINGTON HARRIS. The business will be continued at same place, **1115** and **1117** CHERRY STREET, by the remaining partners, WM. HELME and JOHN MCILHENNY, under the firm name of HELME & MCILHENNY.

WASHINGTON HARRIS,
WILLIAM HELME,
JOHN MCILHENNY.

Upon retiring from a business, my connection with which dates more than the third of a century back, I embrace this opportunity of extending my thanks to the numerous friends and patrons who kindly favored me with their patronage and friendship through that long series of years.

Asking respectfully for the remaining members of the firm a continuance of this friendship and patronage I remain,

Respectfully yours,
497-2t WASHINGTON HARRIS.

Complete Gas Works
FOR SALE.

The Iron Work for a complete Gas Works, with 8 inch connections, consisting of 4 Purifiers, 8 ft. by 10 ft., with Dry Centre Valve, Multitubular Condenser, Scrubber, Bye-pass Valves, 5 feet Station Meter, and Bench Casting for four benches of 5's. All nearly new, and in good condition.

THE MUTUAL GAS LIGHT CO.,
497-tf ST. JOSEPH, MISSOURI.

WANTED,
A Live Man (Engineer Preferred)

To introduce the **"Hydrostatic" Joint** for Gas and Water Mains. A lead Joint, and the best in the world. A good opportunity for a competent man.

W. PAINTER, 44 Holliday St., Baltimore.

FOR SALE,
A Set of Four Purifiers,
6 Ft. by 10 Ft.,

With 8-in. Connections and Centre Valve Complete.

APPLY TO

Newport Gas Lt. Co.,

NEWPORT, R. I.
494-4t

METERS REPAIRED.
J. T. WHEELER,
Inspector and Repairer of Gas Meters.

I would be pleased to hear from gas companies wishing to have meters repaired. Best of references given from different gas companies and State inspectors. Address, for terms,
492-6t 317 CONGRESS ST., WEST, DETROIT, MICH.

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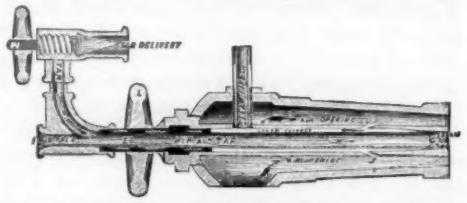
TAR BURNER.



SIMPLEST, CHEAPEST, BEST.

Will be sent to any Gas Works on Trial. Satisfaction Guaranteed.

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PARSON'S BLOWER,

FOR BURNING BREESE, SLACK & FINE COAL.

NOW IN USE AT THE BROOKLYN GAS LIGHT CO.

See Col. Armington's remarks at meeting of the New England Association of Gas Engineers, as reported in this journal of April 2.

H. E. PARSON,
WATERTOWN, N. Y., and 42 PINE ST., N. Y. CITY.

CAST IRON PIPE.

WE HAVE ON HAND, IN STORE, FOR IMMEDIATE SHIPMENT,

A Large Quantity of Cast Iron Pipe,

WITH A FULL ASSORTMENT OF SPECIAL CASTINGS.

MOST OF THEM ARE GAS WEIGHTS—PART OF THEM COATED WATER WEIGHTS.

Made by Warren Foundry, Starr, and Wood,

UNDER CAREFUL INSPECTION, AND ARE OF THE VERY BEST QUALITY.

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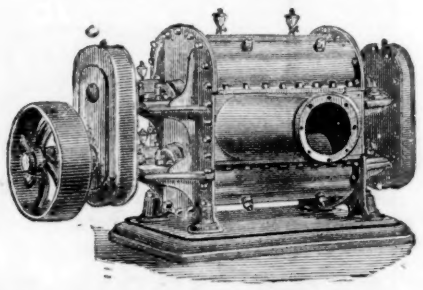

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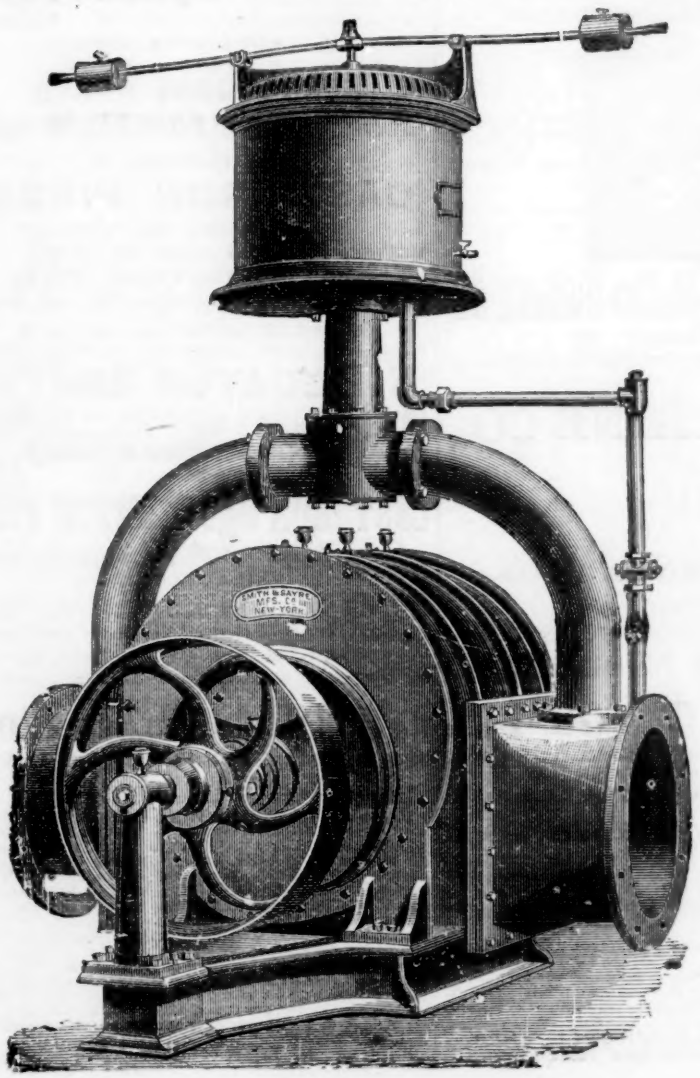

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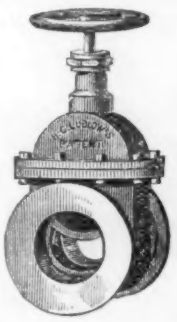

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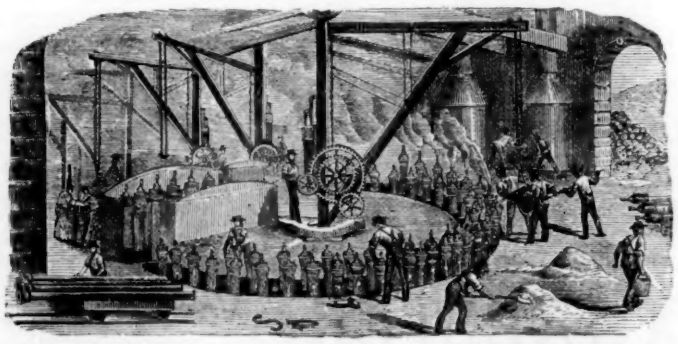

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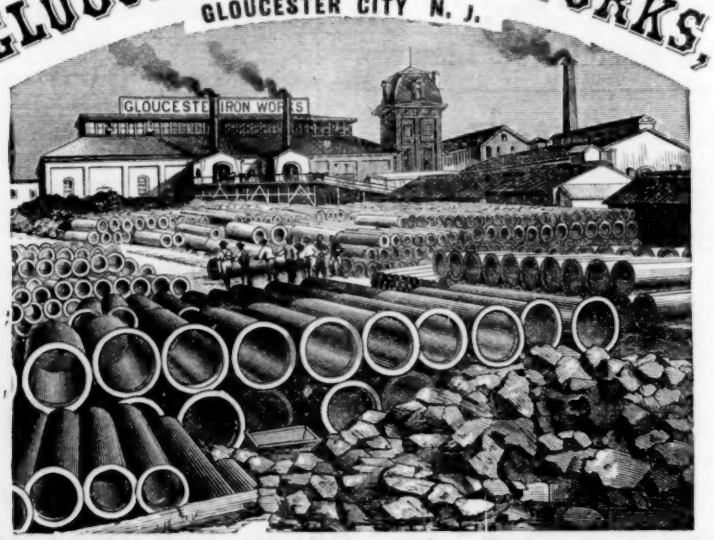

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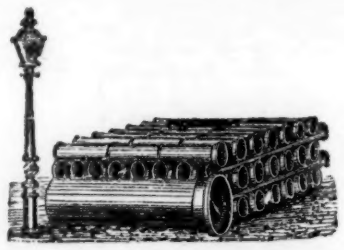

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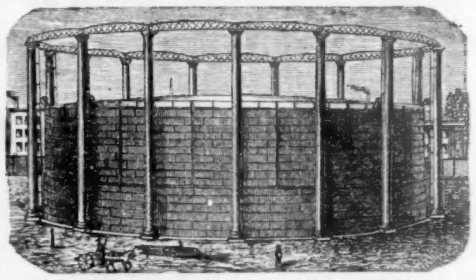

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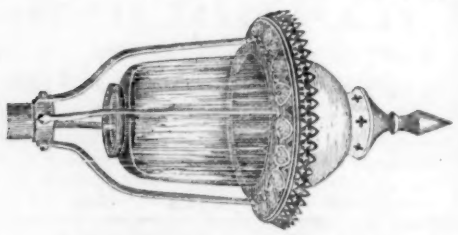

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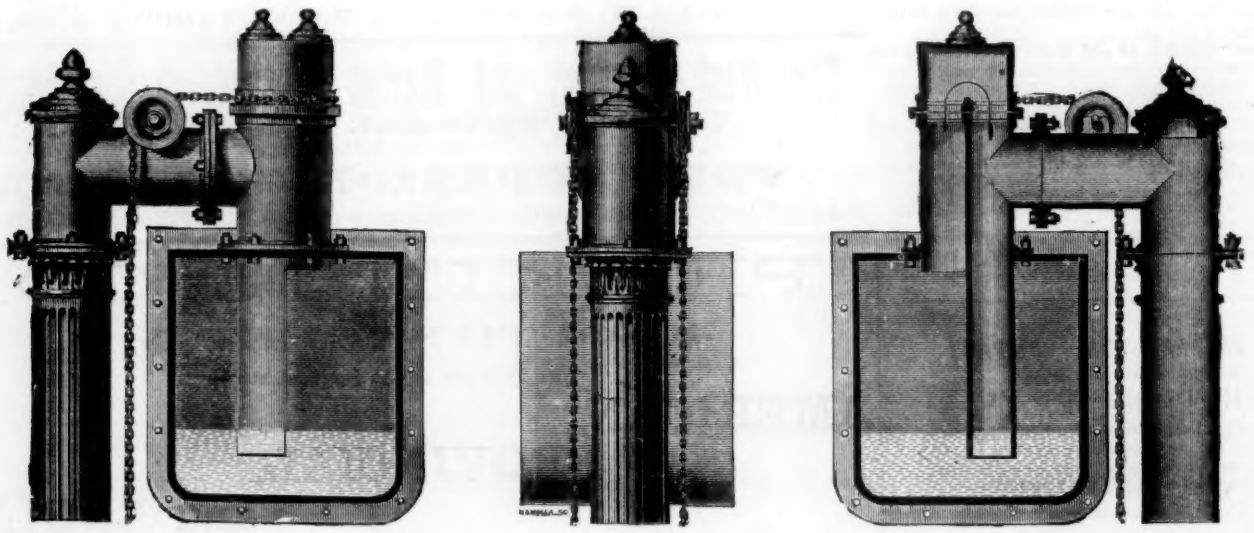

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